DuSable

Cathleen Martwick, Mary Fulghum
VERNETA SIMON, EUGENE JABLONOWSKI, kworthington, terri.haymaker, "Walsh III, Edward V.", "Vickery, Randall G.", "MacDonell, Don", "Kornder, Steve"

12/21/2007 03:11 PM

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<<R200702842-SOW_12-21-07.pdf>> <<200702842-SOW_Appendices.pdf>> <<200702842-SOW_Figure_1.pdf>>

Cathy and Mary,

Attached is the scope of work for the removal of the known areas of impacted material on DuSable. Steve Kornder of STS sent a hard copy of the scope of work to Verneta today. Please call me with any questions. Happy Holidays!

Robert M. Baratta, Jr.

Freeborn & Peters LLP

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STS

Scope of Work for Removal of Radiologically-Impacted Material

DuSable Park

STS Project No. 200702842
December 21, 2007

STS | AECOM

750 Corporate Woods Parkway
Vernon Hills, IL 60061
P 847-279-2500/F 847-279-2510

December 21, 2007

Ms. Verneta Simon
U. S. Environmental Protection Agency, Region 5
77 W. Jackson Blvd., SE-5J
Chicago, Illinois 60604

Re: Scope of Work for Removal of Radiologically-Impacted Material, DuSable Park, Chicago, Illinois – STS Project No. 2000702842

Dear Ms. Simon:

Enclosed please find the Scope of Work for the above-referenced site for your review and comment. We have provided two additional copies for your use and distribution.

Please contact us with any questions or comments you may have regarding the plan.

Regards,

Steven C. Korndér, Ph.D.
Senior Project Geochemist

Don MacDonell
Associate Scientist

cc: Robert M. Baratta, Jr. Freeborn & Peters LLP
Niall Collins, Shelbourne Development Group

Table of Contents

Figures

Appendices

SCOPE OF WORK FOR THE REMOVAL OF RADIOLOGICALLY-IMPACTED MATERIAL - DUSABLE PARK

1.0 Introduction

This Scope of Work addresses the removal of specific known areas of radiologically-impacted material located on DuSable Park (Site) from prior investigation. The Scope of Work describes the:

- Survey methods proposed for identifying radiologically-impacted materials above the 7.1 picocuries per gram (pCi/g) cleanup threshold (Applicable Cleanup Standard) within the areas of known contamination; and

- Procedures for managing the removal of radiologically-impacted soil above the Applicable Cleanup Standard.

Radiologically-impacted material that is excavated will be transported to a disposal facility licensed to dispose of this material or otherwise addressed in accordance with USEPA direction and/or agreement.

2.0 Background

2.1 Site Location

The DuSable Park Site is located in an area of reclaimed land where fill material was placed along the Lake Michigan shoreline beginning in the 1860s. Several properties north of the Chicago River in the Streeterville neighborhood of Chicago exhibit evidence of radiological-impacts evidently from the former processing of thorium-bearing mineral sands by Lindsay Light and Chemical Company. Lindsay Light facilities operated in Streeterville at 22 West Hubbard, 316 East Illinois, and 161 East Grand.

The Site contains six (6) areas of known radiologically impacted soils based on previous studies and recent field investigations by STS and USEPA personnel.

2.2 ProSource 2002 Limited Site Investigation/STS Investigation (2007)

In October 2002, ProSource Technologies, on behalf of Kerr-McGee Corp., performed a gamma radiation surface survey of the Site. ProSource Technologies reportedly detected elevated levels of thorium on the Site and some remediation/removal of impacted material was reportedly conducted. ProSource Technologies identified five (5) areas in which radiation concentrations exceeded the Applicable Cleanup Standards.

During June and July of 2007, STS conducted surface surveying on portions of the site adjacent to the seawall along the Chicago River and the Ogden Slip. No elevated levels of thorium were detected in these areas along the perimeter of the Site. In addition, the USEPA revisited the five areas identified in 2002 by ProSource Technologies. Each of the areas consisted of a shallow pit filled with numerous orange sand bags, which appeared to be underlain by a sheet of black plastic. Gamma readings were made at the top or edges of the sand bags (*i.e.*, the sand bags were not removed to obtain readings directly over the pit soils). Unshielded Ludlum readings obtained by STS at the time of the USEPA surveys appeared to confirm the USEPA results with values ranging from 15,000 to 21,300 counts per minute ("cpm") (generally, 18,563 cpm = 7.1 pCi/g). These five areas have been cordoned off with chain link fencing and/or concrete barriers, and posted with caution signs, in accordance with USEPA direction. A copy of the ProSource Limited investigation is enclosed in Appendix A.

Additionally, STS identified a sixth area of radiologically-impacted material during the screening work for the construction of the ramp in the northwest portion of the Site. STS cordoned this area off with fencing and concrete barriers and installed caution signs.

The six areas of known radiologically-impacted material are depicted on Figure 1.

3.0 Excavation of Radiologically-Impacted Soil

The radiologically-impacted material that is located in the six areas depicted in Figure 1 will be excavated and properly manifested and disposed of at a licensed, off-site facility by Tronox, LLC, a successor to Kerr-McGee Corp. The excavation process will utilize an excavator with a maximum one cubic yard (CY) bucket. This bucket size will facilitate loading the containers without spilling and/or spreading the contamination. When possible, the impacted soil will be loaded directly into transport boxes and/or super sacks. If utilized, transport boxes will be lined, covered, sealed, and the exteriors confirmed clean prior to leaving the Site, in accordance with SOP-320 (Appendix B).

The remediation of these six areas will be confirmed by surveys conducted during the excavation process. Once the confirmation survey has confirmed the absence of impacted soil (SOP-210), the excavation will be available to verification survey and sampling by USEPA in accordance with SOP-223 and SOP-214 (Appendix B). STS will notify USEPA at least seven (7) days in advance of the commencement of the planned work.

4.0 Methods

4.1 Applicable Cleanup Standard

The USEPA has set a cleanup level at 5 pCi/g total radium (Ra-226 and Ra-228) above the background. A level of 2.1 pCi/g total radium is currently considered background for the Streeterville area, within which the Site is located, by the USEPA. Thus, radiologically-impacted material is defined by the USEPA for the Streeterville area as fill material which exceeds a threshold of 7.1 (pCi/g) total radium.

Field measurements will be taken of gamma radiation levels using a Ludlum 2221 rater-scaler and a 2 x 2 Nal detector. The equipment is calibrated to determine the gamma count in cpm that is equivalent to 7.1 pCi/g. Equipment calibration is performed at least annually using the thorium calibration blocks at the Tronox West Chicago Rare Earth Facility. A copy of the most recent calibration records is included in Appendix C.

4.2 Confirmation Surveys for Radiologically-Impacted Areas

Confirmation screening surveys will be conducted during the remedial excavation of the six areas depicted in Figure 1. Excavated locations will be screened in accordance with SOP-210 (Appendix B).

During remediation of radiologically-impacted materials above the Applicable Cleanup Standard, fill/soil within the six areas that has not been documented as clean will be surveyed in-place. Remedial excavation activities will proceed in lifts not to exceed 18 inches in thickness and otherwise will be conducted in accordance with SOP-217 (Appendix B). If an increase in gamma radiation is noted on the order of twice background values, excavation will proceed in thinner lifts to minimize the potential for mixing clean and radiologically-impacted soil.

Soil screening during the course of the remedial excavation activities is intended to minimize the mixing of clean material into materials which are designated for radiological disposal. Soil indicative of levels below 7.1 pCi/g total radium by the confirmation screening process prior to excavation will be staged for potential use as backfill. As previously indicated, excavation conducted to remove radiologically-impacted material will proceed using an excavator with a maximum 1 CY bucket. This bucket size also will allow the excavated soil to be screened a second time before being placed on the backfill pile. This potentially non-impacted soil also will be subject to verification surveys in accordance with SOP-214 (Appendix B).

Prior to the initiation of activities, gamma count rate background levels shall be established for each applicable survey instrument. Six locations shall be chosen in non-radiologically-impacted areas of the Site. A one-minute integrated count shall be obtained at the surface of each location for each survey instrument (Ludlum 2221 with 2" x 2" Nal probe). The measurements collected from each location shall be averaged to establish instrument specific background gamma count rates.

4.3 Verification Sampling

Soil exhibiting contamination in levels above the Applicable Cleanup Standard will be excavated, placed in transport boxes and shipped to a disposal facility licensed to receive this material. Excavated locations will be screened in accordance with SOP-210 (Appendix B). To demonstrate that the Applicable Cleanup Standard has been achieved, a verification sampling program will be conducted in general accordance with SOP-223 and SOP-214 (Appendix B).

A shielded 2 x 2 NaI detector will be used to demonstrate, at least initially, that the location has been appropriately remediated. Pre-verification samples will be collected and analyzed using NUTRANL software or gamma spectroscopy analyses by Huber Consultants Inc. It is anticipated that both the NUTRANL software and gamma spectroscopy analyses will be conducted at an off-site (fixed) laboratory. Samples for high resolution gamma spec analysis will be sent to a subcontract laboratory operated by RSSI. The laboratory data package will include chain-of-custody copies, sample receipt and tracking forms, preparation and analysis logbooks, raw data forms, tabulated data summaries, calibration records and standards, QC sample results, and any corrective action reports (refer to SOP-364 in Appendix B). Gamma spec analysis will be conducted using a Library Energy Tolerance of 1.2 keV and a Gamma Fraction Limit of 71%.

If utilized, NUTRANL results would be provided in two forms. The initial NUTRANL data set will consist of one set per sample and will include: (1) the radionuclide concentrations and error limits for uranium 238, thorium 232, radium 226, and potassium 40; (2) the sample number; (3) date and time sampled; (4) laboratory number (sequential); (5) identity of the analyst; and (6) analytic method (NUTRANL). The second field lab data form will be a consolidated spreadsheet with all analysis in sequence by laboratory number. This table will include the sample number, data and time sampled, radionuclide concentrations and error limits for the four NUTRANL analytes, and a line totaling the thorium and radium concentrations. The field laboratory also will maintain a copy of the chain-of-custody for those samples received and analyzed.

4.4 Materials Management

At present, it is anticipated that the radiologically-impacted material encountered above the Applicable Cleanup Standard will be sent to Energy Solutions Clive Facility (f/k/a Envirocare), located in Clive, Utah. Shipping and placarding will be in accordance with all Department of Transportation (DOT) regulations for shipping radiologically-impacted material. Permitting for disposal at Energy Solutions Clive Facility will be arranged before impacted material is loaded for shipment.

4.5 Decontamination

All discarded materials, waste materials, and other field equipment and supplies shall be handled in such a way to prevent the potential spread of contamination during excavation and restoration activities. Discarded items that have contacted contaminated materials will be containerized and stored for disposal at the approved disposal facility. Non-contaminated items to be discarded will be collected for disposal as general refuse waste. Personnel and sampling equipment decontamination are described in the Decontamination Procedure included as SOP-347 (Appendix B).

4.6 Site Contacts

The following persons will be the primary contacts for the radiological remediation work:

Don MacDonell
STS Consultants, Ltd.
111 West Washington Street, Suite 1750
Chicago, Illinois 60602
(312) 307-7293

Steve Kornder
STS Consultants, Ltd.
750 Corporate Woods Parkway
Vernon Hills, Illinois 60061
(847) 279-2448

5.0 References

ProSource Technologies-Limited Site Investigation-June-2002

USEPA letter dated December 1, 2000.

APPENDIX A

ProSource Technologies Limited Site Investigation- June-2002

APPENDIX B

Standard Operating Procedures

SOP-210	Gamma Radiological Surveys
SOP-214	Soil Sampling Procedure
SOP-217	Excavation Procedure
SOP-223	Verification Survey
SOP-320	Radioactive Material Shipments
SOP-347	Decontamination
SOP-364	Sample Preparation Procedure for Gamma Spectral Analysis

APPENDIX C

Instrument Calibration

APPENDIX A

ProSource Technologies Limited Site Investigation- June-2002

277 Coon Rapids Blvd. • Suite 304 • Coon Rapids, MN 55433 • Phone (763) 786-1445 • FAX (763) 786-1030 • www.prosourcetech.com

June 12, 2002

COPY

Mr. Bernard Bono
Senior Engineer
Kerr-McGee Chemical LLC
800 Weyrauch Street
West Chicago, Illinois 60185

Re: DuSable Park Limited Site Investigation
Chicago, Illinois
ProSource Project No. 386-00

Dear Mr. Bono:

ProSource Technologies, Inc. (ProSource) is pleased to submit this letter report to Kerr-McGee Chemical LLC (KM) which presents the results of the recently completed Limited Site Investigation at the DuSable Park Site (Site) in Chicago, Illinois (Figure 1). All field work was completed in accordance with the *Investigation Work Plan, DuSable Park Site* (Work Plan) dated November 12, 2001 and last revised March 21, 2002. All work was also supervised by United Stated Environmental Protection Agency (USEPA) staff. The following sections present a summary of the field work activities, a presentation of the data, and a discussion of the results.

Summary of Field Work Activities

As outlined in the Work Plan, the work included a limited investigation of four previously identified areas of concern (Figure 2). Generally, the work included a surface gamma survey, downhole gamma logging, soil sampling, sample preparation, surveys for unrestricted release of equipment, and decontamination. Initially, surface gamma surveys were conducted of each area of concern. The surface gamma surveys were completed using a Ludlum® Model 2221 equipped with a Ludlum® Model 44-10 probe which were coupled to a Trimble® Model Pro-XR global positioning system (GPS) unit and a hand-held datalogger. The datalogger recorded the physical locations and gamma readings during the surface gamma survey. Where feasible, the surface gamma surveys extended at least 10 meters laterally of any elevated gamma readings.

Upon completion of the surface gamma survey, the data was processed to determine the areas with the highest gamma readings. At the point of the highest surface gamma reading in each area, the GPS unit was used to navigate back to five small areas of elevated gamma readings (Figures 3 through 6). A test hole was then advanced vertically by driving a steel casing to a depth of two feet via hand or mechanical methods. The borehole was then gamma logged with a calibrated meter to determine if radioactive material was present in concentrations exceeding 7.1 picocuries per gram (pCi/g). In each case, material exceeding the criteria was encountered within the upper two feet resulting in the test hole being advanced to a deeper depth and four additional test holes (or step outs) being advanced surrounding the initial test hole.

Upon completion of the gamma logging, shallow soil samples were collected using a stainless steel hand auger from the depth corresponding to the highest downhole gamma reading. In each case, a soil sample was collected from three to nine inches below grade which corresponded to the six inch depth interval of the test hole. The sample was throughly composited in the field and rocks, sticks and foreign objects greater than approximately one-inch were removed. Approximately four pounds of the field sample was placed into sturdy water tight bags

for transport to the KM laboratory located in West Chicago, Illinois. Once the field sample was collected, the remaining soil was given to USEPA field staff who in turn conducted additional screening and compositing in the field.

Soils encountered at each sampling location were typically classified as very dark brown to black, silty fine to medium grained sand with gravel. Fragments of coal, slag, brick and concrete were typically present at all locations.

Upon completion of all field sampling activities, all drilling locations and pertinent land features were surveyed utilizing a Trimble® Model TTS 500 Total Station. Copies of the surface gamma survey data are included in Attachment A. Copies of the Borehole Field Logs, field notes and meter calibration data are included in Attachment B. The KM laboratory report is included in Attachment C.

Data Summary

Surface Gamma Survey

As previously stated, the initial task was to complete a surface gamma survey. Figures 3 through 6 present the results of the surface gamma surveys. During the survey, over 2,946 data points were obtained with only 67 data points exhibiting gamma readings above the 7.1 pCi/g criteria. The 67 points were determined to be very localized and confined to five small areas. Table 1 presents the location and highest gamma readings for each area of concern. As shown in Table 1, the highest gamma readings ranged from a low of 7.9 pCi/g at surface gamma survey data point 512 to a high of 17.7 pCi/g at surface gamma survey data point 2756.

Downhole Gamma Logging

Initially, one test hole was advanced at surface gamma survey data points 512, 832, 1951 and 2756. Table 2 presents the results of the gamma logging for each test hole and Figure 6 depicts each test hole location. Each test hole was advanced to a minimum depth of 24 inches with some extending to deeper depths. Downhole gamma readings above the 7.1 pCi/g criteria equivalent of 1,849 counts per minute (cpm) from each of the initial four test holes ranged from a low of 7.9 pCi/g at test hole 512 to a high of 13.3 pCi/g at test hole 832. In each case, the highest gamma reading was obtained from the six inch depth interval of each test hole resulting in the advancement of four "step out" test holes. It should be noted that no gamma readings were obtained above the 7.1 pCi/g criteria equivalent of 1,849 cpm in any of the other "step out" test holes including surface gamma survey point 1826 which was utilized as a southern step out for test hole 1951.

Laboratory Results

Analysis of the four collected soil samples was performed by the KM laboratory in West Chicago, Illinois. Samples were prepared and gamma ray spectral analysis was performed using Canberra® HPGe detector system. The KM laboratory report is included in Attachment C. Samples were quantified for total radium as follows:

Total Radium (Ra) = Lead (Pb) 214 + Actinium (Ac) 228
Pb 214 is in the Uranium (U) 238 chain and is a measurement of Ra 226
Ac 228 is in the Thorium (Th) 232 chain and is a measurement of Ra 228
Therefore,
Total Radium = Ra 226 + Ra 228

Table 3 presents a summary of the KM laboratory results. Total Radium was identified above the 7.1 pCi/g criteria in samples collected from test holes 512 (11.7 pCi/g), 832 (9.5 pCi/g) and 1951 (15.0 pCi/g). Total Radium identified at test hole 2756 was 0.58 pCi/g which is well below the 7.1 pCi/g criteria.

Discussion of Results

Surface Gamma Survey

As presented above, surface gamma readings identified above the 7.1 pCi/g criteria were identified at five localized areas of the Site. Average surface gamma readings were observed below the 7.1 pCi/g criteria for 100 square meters surrounding each of the four highest target areas (Table 1) as follows (Attachment D):

3.7 pCi/g	Gamma point 512 (202 points)
3.7 pCi/g	Gamma point 832 (255 points)
4.2 pCi/g	Gamma point 1951 (386 points)
3.9 pCi/g	Gamma point 2756 (249 points)

In all cases, the identified surface gamma readings above the 7.1 pCi/g criteria were determined to be very localized and generally confined to areas less than one meter in diameter.

Downhole Gamma Logging

Gamma readings identified above the 7.1 pCi/g criteria were typically identified at the six inch depth interval at each of the four initial test holes. Thickness of readings above 7.1 pCi/g were six inches at test holes 832 and 2756, 12 inches at test hole 512, and 24 inches at test hole 1951. A minimum of two gamma readings below 7.1 pCi/g were obtained from the bottom of each test hole.

Average gamma readings for the six inch depth interval at each initial test hole and corresponding "step out" test holes were observed well below the 7.1 pCi/g criteria at all locations. Specifically, the average gamma readings at the six inch depth interval for each test hole group were 4.5 pCi/g at 512, 4.4 pCi/g at 832, 4.9 pCi/g at 1951 and 3.5 pCi/g at 2756.

In all cases, the identified downhole gamma measurements were identified less than 24 inches in depth and not identified in any "step out" test holes which further supports the findings that the gamma readings are not laterally extensive.

Laboratory Data

Four samples were analyzed by the KM laboratory using gamma ray spectral analysis. Total Radium was identified slightly above the 7.1 pCi/g criteria in three of the samples collected from test holes ranging in gamma activity from 9.2 pCi/g to 15.0 pCi/g. Generally, the soil sample results are comparable to the downhole gamma readings in that the gamma readings are slightly elevated above the 7.1 pCi/g criteria.

However, total Radium identified at test hole 2756 was 0.6 pCi/g which is well below the 7.1 pCi/g criteria. This result does not compare favorably with the downhole gamma measurement of 2,667 cpm or 10.2 pCi/g. The

source of the elevated downhole gamma measurement is likely a piece of oversized material such as a brick, slag or coal fragment. Oversized material (>1 inch diameter) were segregated from the soil matrix during soil sampling in accordance with the DuSable Park Soil Sampling Work Instruction included in the Work Plan.

Closing

I sincerely appreciate the opportunity to conduct the Limited Site Investigation at DuSable Park. If you have any questions, please do not hesitate to contact me at (763) 786-1445.

Very truly yours,

ProSource Technologies, Inc.

Wade A. Carlson
Senior Geologist/Project Manager

F:\jobs\381-400\386- DuSable Park\Final report rev 3.wpd

TABLES

TABLE 1
Summary of Highest Surface Gamma Survey Points
DuSable Park
Chicago, Illinois
ProSource Project No. 00-386

Surface Gamma Survey ID Number	Easting	Northing	GPS Date	GPS Time	Gamma (cpm)	Gamma (pCi/g)	Survey Type
512	1180378.80	1903282.07	5/3/02	10:36:37AM	8,062	8.92	Pro XR
832	1180334.37	1902987.89	5/3/02	10:55:56AM	8,910	9.85	Pro XR
1826	1180233.58	1903113.83	5/3/02	11:33:26AM	7,142	7.90	Pro XR
1951	1180218.27	1903130.36	5/3/02	11:39:52AM	15,339	16.96	Pro XR
2756	1180251.41	1903157.24	5/3/02	12:09:27PM	16,044	17.74	Pro XR

Notes:
1. cpm = counts per minute
   pCi/g = picocuries per gram
   GPS = Global Positioning System
   ProXR = Trimble Model ProXR GPS
2. Coordinates based on State Plane - Illinois East 1983

TABLE 2
Downhole Gamma Results
Limited Site Investigation
DuSable Park
Chicago, Illinois
ProSource Project No. 386-00

Test Hole>>	512 Center		512 N 5		512 E 5		512 S 5		512 W 5	
Depth (inches)	cpm	pCi/g	cpm	pCi/g	cpm	pCi/g	cpm	pCi/g	cpm	pCi/g
0"	1,534	6.0	360	1.4	364	1.4	304	1.2	262	1.0
6"	*3,073*	*12.0*	965	3.8	655	2.6	568	2.2	483	1.9
12"	*2,035*	*7.9*	1,581	6.2	640	2.5	601	2.3	717	2.8
18"	1,171	4.6	1,347	5.3	306	1.2	921	3.6	745	2.9
24"	701	2.7	517	2.0	350	1.4	852	3.3	851	3.3
30"					353	1.4	675	2.6	1,008	3.9
36"					401	1.6			994	3.9
42"					464	1.8			709	2.8
48"					683	2.7				
54"					721	2.8				
60"					Refusal					

Test Hole>>	832 Center		832 S 5		832 E 5		832 N 5		832 N 5	
Depth (inches)	cpm	pCi/g	cpm	pCi/g	cpm	pCi/g	cpm	pCi/g	cpm	pCi/g
0"	1,276	5.0	260	1.0	349	1.4	254	1.0	209	0.8
6"	*3,416*	*13.3*	453	1.8	998	3.9	399	1.6	405	1.6
12"	1,598	6.2	465	1.8	1,435	5.6	349	1.4	820	3.2
18"	593	2.3	518	2.0	440	1.7	591	2.3	757	3.0
24"	474	1.8	471	1.8	387	1.5	402	1.6	611	2.4
30"			453	1.8			254	1.0		
36"										
42"										
48"										
54"										
60"										

Test Hole>>	1951 Center		1826		1951 N 5		1951 W 5		1951 E 5	
Depth (inches)	cpm	pCi/g	cpm	pCi/g	cpm	pCi/g	cpm	pCi/g	cpm	pCi/g
0"	*2,738*	*10.7*	701	2.7	625	2.4	314	1.2	291	1.1
6"	*3,094*	*12.1*	1,160	4.5	997	3.9	544	2.1	462	1.8
12"	*2,722*	*10.6*	700	2.7	1,054	4.1	772	3.0	564	2.2
18"	*2,296*	*9.0*	635	2.5	858	3.3	743	2.9	623	2.4
24"	1,510	5.9	632	2.5	686	2.7	771	3.0	621	2.4
30"	1,129	4.4					768	3.0	594	2.3
36"							848	3.3		
42"							828	3.2		
48"							814	3.2		
54"										
60"										

Test Hole>>	2756 Center		2756 E 5		2756 W 5		2756 S 5		2756 N 10	
Depth (inches)	cpm	pCi/g	cpm	pCi/g	cpm	pCi/g	cpm	pCi/g	cpm	pCi/g
0"	1,125	4.4	262	1.0	350	1.4	286	1.1	277	1.1
6"	*2,667*	*10.4*	342	1.3	545	2.1	470	1.8	443	1.7
12"	879	3.4	488	1.9	597	2.3	522	2.0	451	1.8
18"	518	2.0	490	1.9	467	1.8	508	2.0	397	1.5
24"	529	2.1	558	2.2	434	1.7	497	1.9	389	1.5
30"	426	1.7	528	2.1						
36"	390	1.5	503	2.0						
42"										
48"										
54"										
60"										

Notes:
1. Bold, italics denotes above 7.1 pCi/g or 1,849 cpm criteria.
2. [illegible] counts per minute, pCi/g = picocuries per gram

TABLE 3
Summary of Laboratory Results
DuSable Park
Chicago, Illinois
ProSource Project No. 00-386

Sample #	Ra 226	Ra 228	Total Radium
512	1.985	9.718	11.7
832	1.814	7.643	9.5
1951	0.7814	14.18	15.0
2756	0.1368	0.4431	0.6

Notes:
All data presented in picocuries per gram (pCi/g).

FIGURES

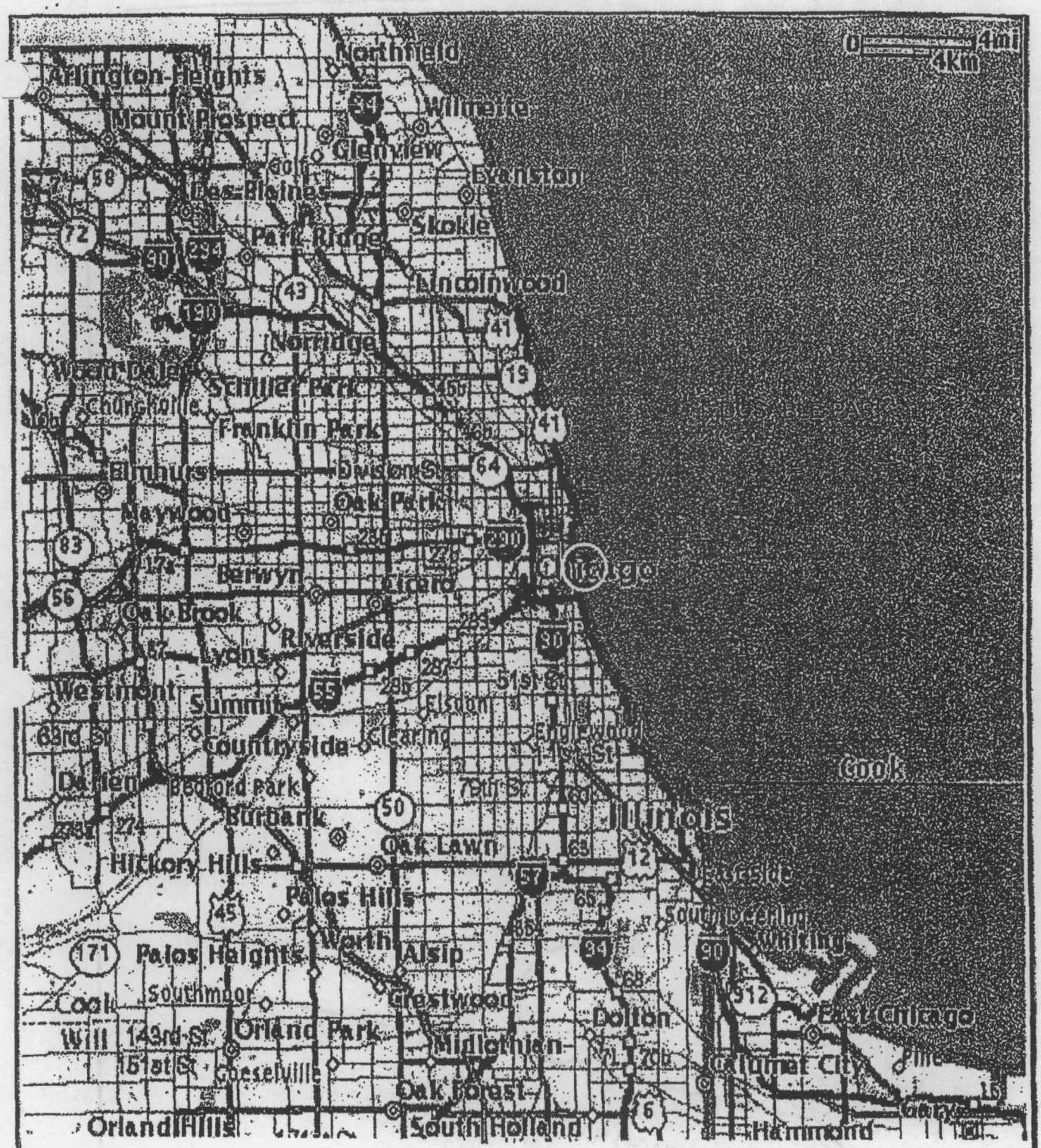


FIGURE 1
SITE LOCATION MAP
DUSABLE PARK, CHICAGO, ILLINOIS

TECHNOLOGIES, Inc.

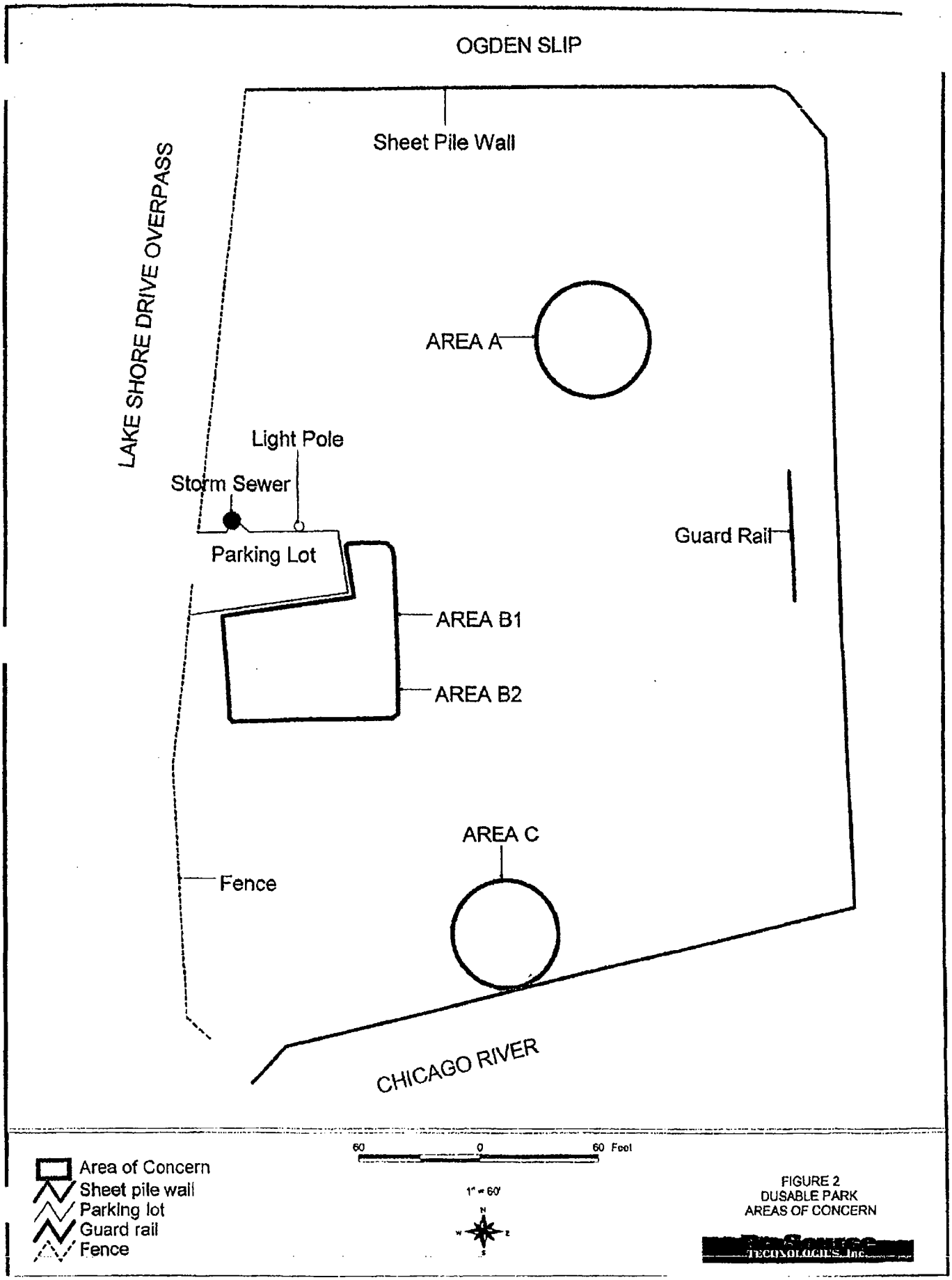
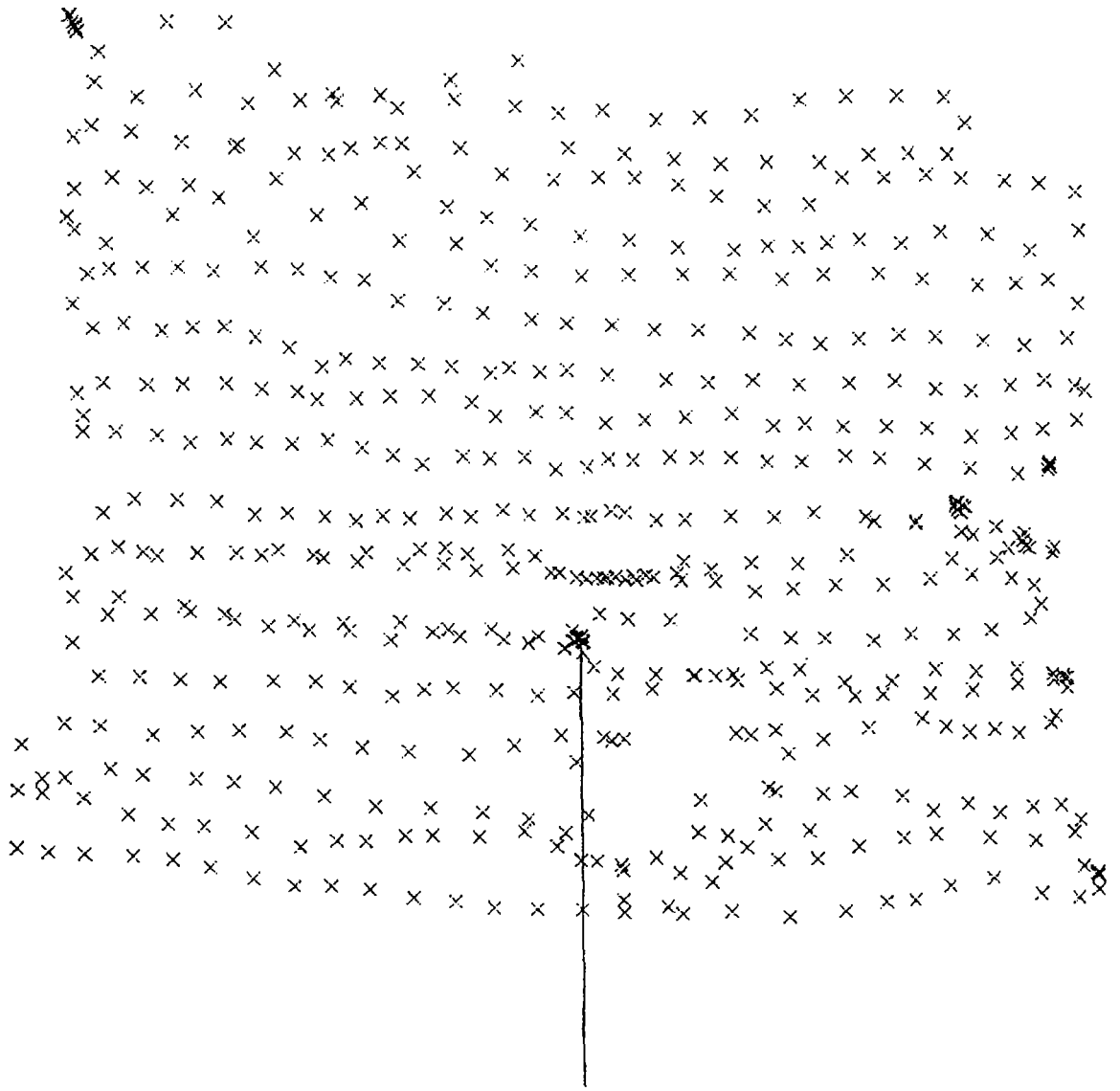


FIGURE 2
DUSABLE PARK
AREAS OF CONCERN

TECHNOLOGIES, Inc.



10 0 10 Feet

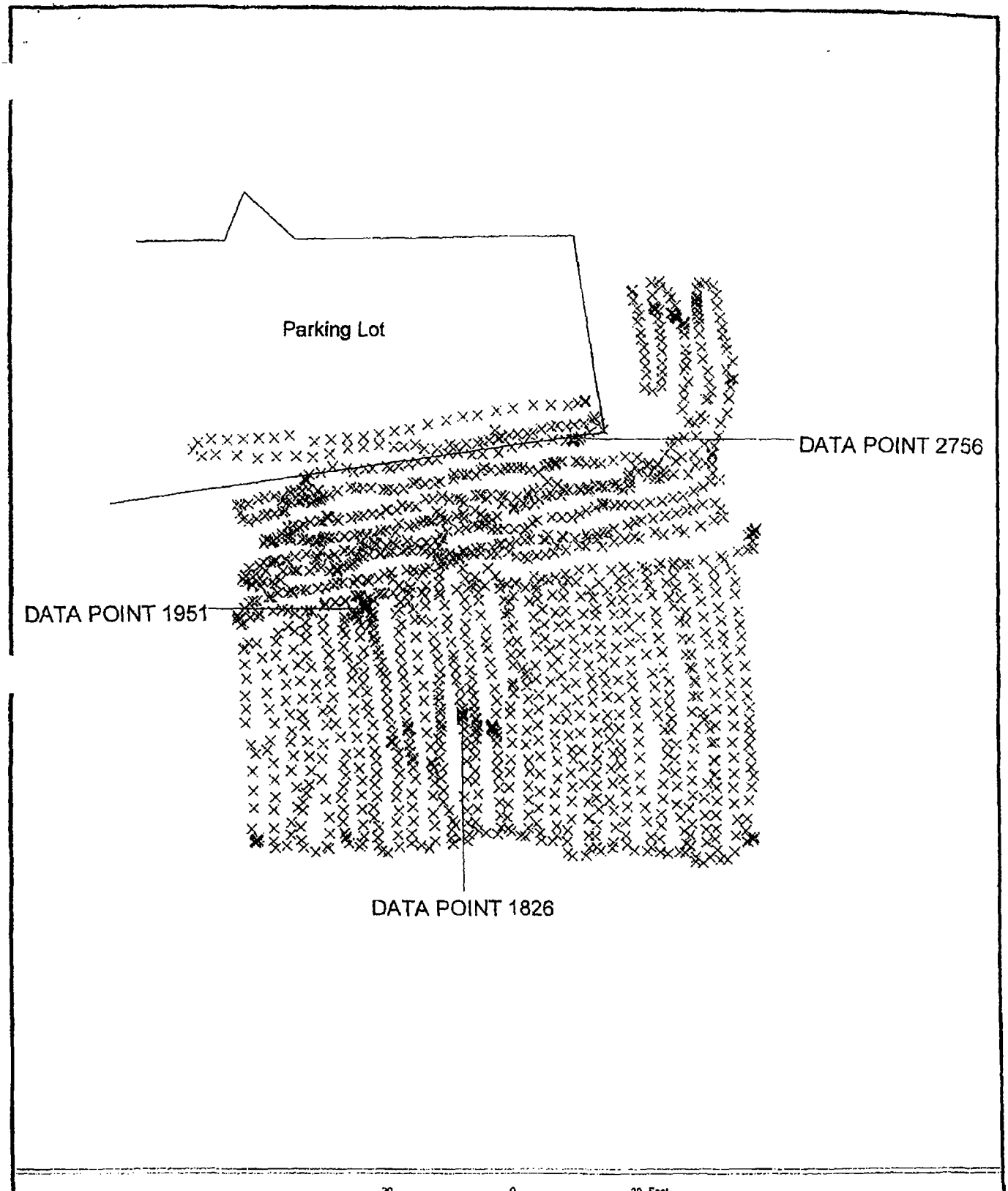
Parking lot
DuSable Park Surface Gamma Survey 5/3/02
× 0 - 7.09
× >7.100 - 9999

1" = 10'

N
W E
S

FIGURE 3
AREA A
SURFACE GAMMA SURVEY

TECHNOLOGIES, INC.



20 0 20 Feet

Parking lot
DuSable Park Surface Gamma Survey 5/3/02
0 - 7.09
>7.100 - 9999

1" = 20'

N
W E
S

FIGURE 4
AREA B1 AND B2
SURFACE GAMMA SURVEY

Technologies, Inc.

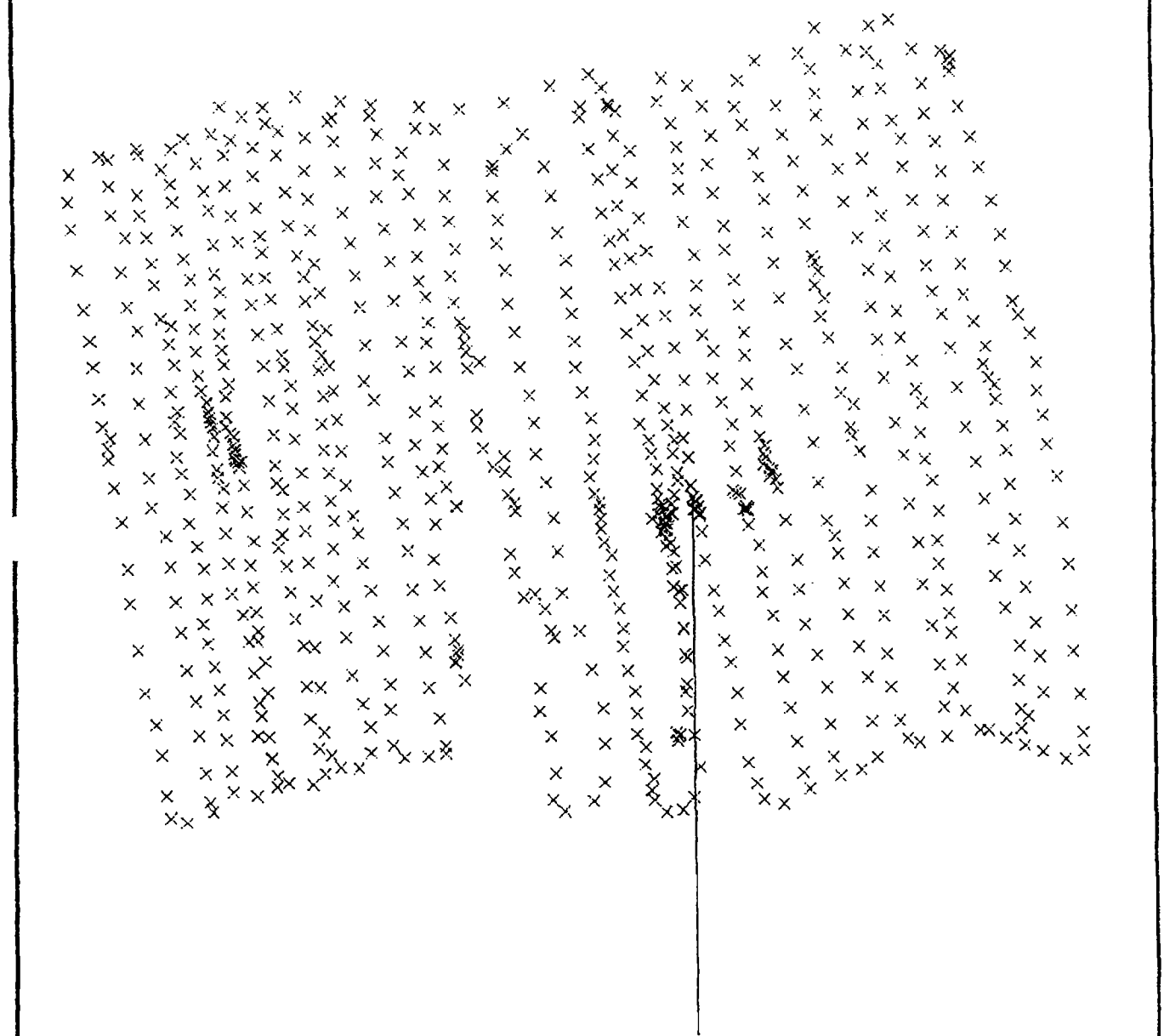


FIGURE 5
AREA C
SURFACE GAMMA SURVEY

TECHNOLOGIES, Inc.

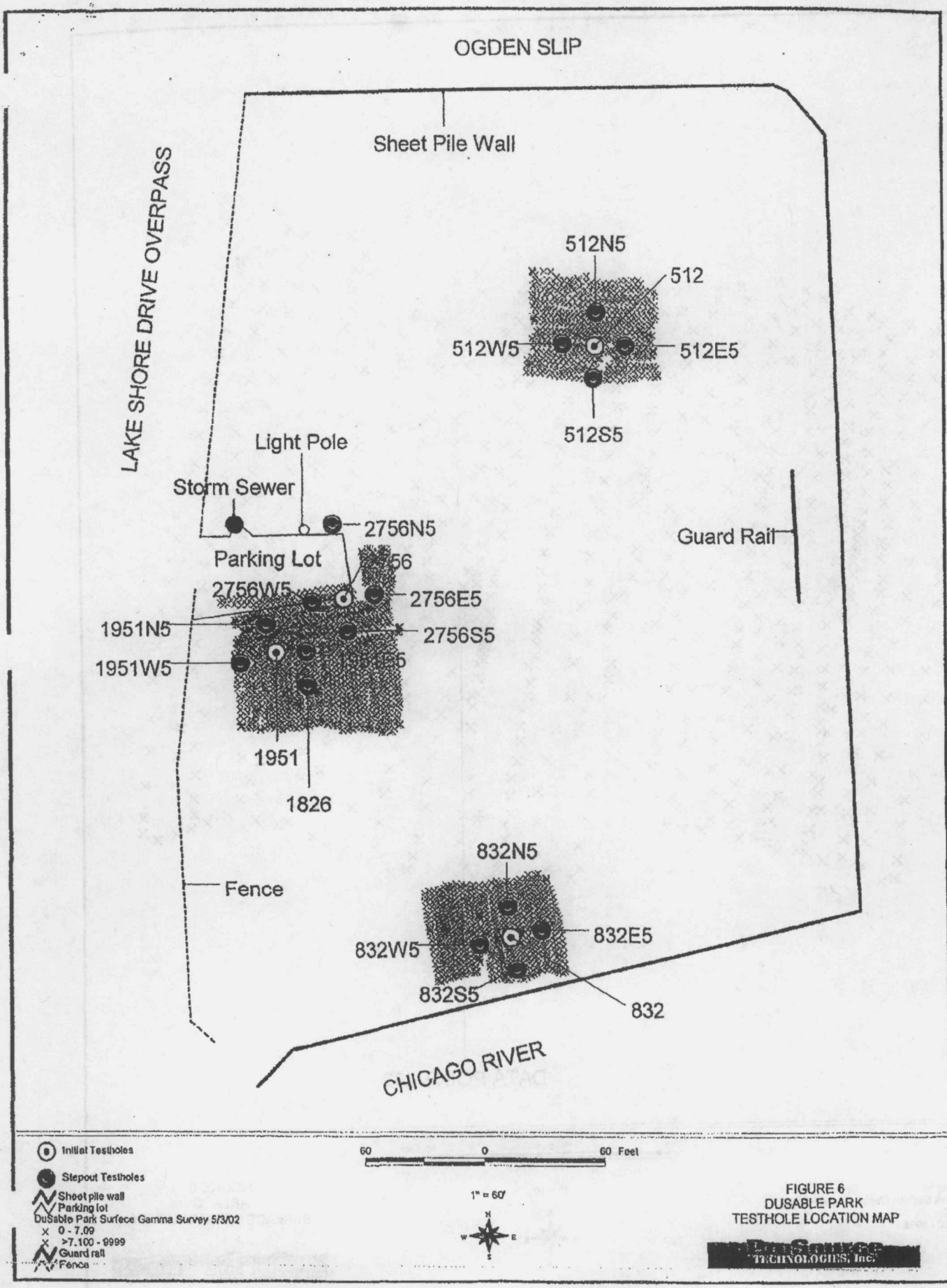


FIGURE 6
DUSABLE PARK
TESTHOLE LOCATION MAP

TECHNOLOGIES, Inc.

APPENDIX B

Standard Operating Procedures

SOP-210	Gamma Radiological Surveys
SOP-214	Soil Sampling Procedure
SOP-217	Excavation Procedure
SOP-223	Verification Survey
SOP-320	Radioactive Material Shipments
SOP-347	Decontamination
SOP-364	Sample Preparation Procedure for Gamma Spectral Analysis

DUSABLE PARK

STANDARD OPERATING PROCEDURE

Title: Gamma Radiological Surveys

Document: SOP-210

Revision Number: 0

Date: October 5, 2007

Replaces: New

GAMMA RADIOLOGICAL SURVEYS

1.0 PURPOSE

This procedure provides protocols for pre-verification or verification gamma radiological surveys.

2.0 SCOPE

Radiological surveys will be performed at the designated Site as part of the pre-excavation, excavation, pre-verification, and/or verification surveying programs.

3.0 REFERENCES

None.

4.0 EQUIPMENT AND MATERIALS

The following equipment may be used as part of the survey programs. Other equipment may be substituted if necessary because of availability of the items listed or the conditions encountered at the site.

- Trimble Pathfinder Pro XR 4.1 GPS (optional).
- 2-inch by 2-inch NaI (Tl) gamma detector.
- Ludlum Model 2221 portable scaler ratemeter analyzer.

5.0 INSTRUCTIONS FOR RADIOLOGICAL SURVEY

5.1 Establishment of Background Gamma Count Rate

5.1.1 The gamma count rate background levels shall be established for each applicable survey instrument. Six randomly selected locations of similar media (i.e., paved, landscaped, etc.) shall be chosen in non-radiologically impacted areas of the Site. A five-minute integrated count shall be obtained at the surface of each location for each survey instrument (Ludlum 2221 with 2" X 2" NaI probe). The measurements collected from each location shall be averaged to establish an instrument specific background gamma count rate.

5.2 Land Survey Procedure

5.2.1 Two perpendicular baselines will be established.

5.2.2 A grid along the baseline will be established using cloth or steel tape and a compass, if necessary. Stakes, survey flags, or paint will be placed as needed to delineate grid or traverse lines. The grids will be spaced about five meters apart.

5.2.3 The baseline, permanent structures, areas of remediation, and other areas of interest will be illustrated in the field logbook.

5.3 Gamma Survey Procedure

5.3.1 The Ludlum ratemeter is set for 2-second time-weighted average count rate.

5.3.2 Hold the survey meter probe parallel to the ground surface at a height of approximately two to six inches.

5.3.3 Walk along grid lines at a maximum speed of about 0.5 meters per second (1 mile per hour).

5.3.4 Continue surveying until all survey grids have been traversed.

5.4 Radiological Survey of On-Site Materials

5.4.1 Material that is excavated and placed in the clean stockpile will be surveyed two times. The first survey will be performed prior to excavation activities.

5.4.2 The second survey will be performed during the excavation of the non-contaminated soil.

The soils will be surveyed before they are placed in the stockpile. Based on the gamma scan, the material will either be designated as contaminated material and immediately loaded for transportation and disposal or tentatively designated as clean and stockpiled for subsequent soil sampling per SOP-214.

5.5. Daily Surveys

5.5.1 Routine daily surveys shall be performed for each day of operations at the site.

5.5.2 The routine surveys will monitor areas in the immediate vicinity of excavations and along soil movement paths to ensure that radiation levels are not affected by activities.

5.5.3 Routine surveys shall be documented by preparing a drawing of the survey results in the field logbook, indicating either the location and value of individual measurements, or contours of the measured gamma field.

5.5.4 Surveys of excavation areas will be made at the request of the Field Team Leader to assess the progress of the removal. These surveys will not be documented, but will be used by the Field Team Leader to manage the excavation.

5.6 Pre-Verification or Verification Survey

5.6.1 Upon completion of excavation activities, either a pre-verification survey shall be performed to ensure that the excavation is ready for a final verification survey by USEPA or a verification survey shall be performed to ensure that the excavation is ready for backfill based on USEPA approval.

5.6.2 The survey is conducted at the same time as the excavation work phase. The survey method is performed as specified in Sections 5.2 and 5.3. Upon completion of the survey and excavation phase, a Notification of Successful Pre-Verification or Verification is sent to the USEPA requesting a final verification survey or approval to backfill.

5.7 Site Grading Survey

5.7.1 Surveys will likely be conducted at the same time as the grading activities and will be performed as specified in Section 5.3 of this SOP.

5.7.2 The corners or boundaries of the area to be surveyed will be tied into a site-wide coordinate/survey network. Stakes, survey flags, or paint will be placed along the boundaries of the survey area using a cloth/steel tape or wheel at approximately 5 meter intervals to subdivide the area into 5 x 5 meter areas.

5.7.3 Each 5 X 5 meter area will be traversed using a line spacing of approximately 1 meter. Readings greater than twice background will be painted and flagged for further investigation.

5.7.4 The maximum gamma count and readings over twice background will be recorded on the radiation survey form for site grading. Permanent structures and other issues of interest also will be included on the radiation survey form.

DUSABLE PARK

STANDARD OPERATING PROCEDURE

Title: Soil Sampling Procedure

Document: SOP-214

Revision Number: 0

Date: October 5, 2007 Replaces: New

SOIL SAMPLING PROCEDURE

1.0 PURPOSE

The purpose of this procedure is to present protocol for collecting soil samples for the Site.

2.0 SCOPE

This procedure applies to samples collected for radiological or geotechnical analysis. Soil samples may be collected of potential backfill soils or other soils. The Field Team Leader will coordinate the sampling efforts.

3.0 REFERENCES

U.S. Nuclear Regulatory Commission, NUREG/CR-5849, Manual for Conducting Radiological Surveys in Support of License Termination, June 1992.

4.0 EQUIPMENT AND MATERIALS

4.1 Equipment and Materials Management

Downhole tools and samplers are cleaned in accordance with the Decontamination Procedure (SOP-347).

Cuttings, fluids, samples, and water are placed in 55-gallons drums, labeled, properly stored on-site, and disposed of in a manner that does not violate local, state or federal rules or regulations and in a manner that does not damage public or private property.

4.2 Sampling Equipment and Materials

Equipment used for soil sampling includes the following:

- Auger or other Coring Tool
- Shovel and Trowel
- Plastic Collection Bags
- Plastic Sheets (optional)
- Sampling Tracking Form (Form SOP-214-1)
- Field Logbook (SOP-215)
- Field Sample Screening Form (Form SOP-214-2 or holding samples)
- Pin Flags (for marking sample locations)
- Container (for collecting potentially contaminated waste generated during the sampling process) (e.g., gloves, plastic sheets, etc.)
- Bucket (filled with clean rinse water)
- Bucket (for homogenizing samples)
- Stainless Steel Brush
- Moist Towelettes
- Paper Towels
- Latex Gloves
- Survey Instrument (for verifying clean sampling equipment and hands).

Other equipment may be substituted, if necessary, because of availability of the items listed or the conditions encountered at the site. Substitute equipment shall be documented in the Field Logbook and approved by the Field Team Leader.

5.0 SAMPLING PLAN

Selection of the sampling plan to characterize a soil is a function of the goals of the investigation, the variability of the parameters being measured, and the impact of the variability on the conclusions. Samples may be collected randomly or they may be collected from specific areas deliberately chosen to represent the range of conditions expected or unusual conditions of particular interest. In general, randomly chosen samples are appropriate to assess overall site conditions. However, there may be instances where the significance of an observed condition is of interest. The choice of method will, therefore, depend on the specific goals of the sampling activity.

The procedure presents sampling methods based on random sampling. For the reasons stated above, variations to the methods provided in this procedure may be requested by the Field Team Leader. Such variations shall be documented in the Field Logbook by field personnel.

6.0 ON-SITE STOCKPILE SOIL SAMPLING

The following are the steps to be followed for on-site stockpile soil sampling.

6.1. Excavated soil may be stockpiled. Samples from the stockpiles may be analyzed.

6.2. The soil may be stockpiled in piles varying from a few to several thousand cubic yards. Because of this potential variation in pile size, no single method for sampling or type of equipment can be prescribed that will work for every situation. The two basic methods that can be used for sampling stockpiles, core sampling method and lift sampling method, are described in paragraphs 7.3 and 7.4, respectively. Both methods are based on the premise that in order for a sample to be representative of the pile, every particle in the pile must have an equal probability of being included in the sample.

6.3 One of the methods, the core sampling method, assumes that the pile can be completely penetrated using a coring tool (i.e., sampling probe or drill rig). On conical shaped piles, the sample is to be taken approximately perpendicular to the surface of the pile, midway between the peak and the base, to the center of the pile. On piles with flattened tops, the sample is to be taken perpendicular to the surface from the top to the bottom of the pile.

6.4 The other stockpile sampling method, the lift sampling method, assumes that the pile can not be completely penetrated with a sampling tool, and therefore must be sampled either as the soil is placed in lifts onto the pile or before the soil is removed in lifts for use. The samples will, therefore, only be representative of the discrete layer of soil that is exposed to the sampling.

6.5. With either sampling method, to identify the areas to be sampled, the pile shall always be faced looking north. For flat topped piles, divide the stockpile into an imaginary grid with square or rectangular shaped sections approximately equal in area; the grids on flat topped piles should be numbered from left to right, top to bottom. For conical shaped piles, divide the stockpile into an imaginary grid with pie shaped sections of equal areas; the grids on conical shaped piles should be numbered in clockwise pattern.

6.6. Determine the initial number of grids and samples as follows:

Pile Size (cubic yards)	Number of Grids	Number of Lift Samples[1]	Number of Core Samples[2]
< 50	3	3	3
50 to 100	5	5	5
101 to 500 .	6	5	6
500 to 1,000	7	5	7
1,000 to 2,000	8	6	8

Pile Size (cubic yards)	Number of Grids	Number of Lift Samples[1]	Number of Core Samples[2]
2,000 to 4,000	9	6	9
4,000 to 6,000	10	7	10
6,000 to 8,000	11	7	11
8,000 to 10,000	13	8	13
10,000 to 20,000	16	8	16
20,000 to 40,000	20	10	20
40,000 to 70,000	30	15	30
70,000 to 100,000	36	15	36
100,000 to ---[3]	36+	15+	36+

Notes:

1 Take one sample from each grid randomly chosen. In order to choose the grids to be sampled randomly, use some blank sample identification tags and number the tags from one (1) to (n), where (n) represents the number of grids in each pile. Put the tags into a sample bag, shake the bag and reach in and blindly select a tag. Continue selecting tags until the required number of grids are selected. The numbers will be chosen without replacement, that is, without returning the used number to the bag. The samples shall be taken from the grids that correspond to the randomly chosen numbers. An alternative method would be to use a computer generated random numbering system available in various spreadsheet programs (i.e., Excel).

2 From the randomly chosen grids, take one composite sample for approximately every ten (10) feet of soil depth to obtain the required number of samples. For example: if a 98 cubic yard pile is 10 feet high, according to the above table, five (5) composite samples are required (i.e., one for each grid). If an 11,000 cubic yard pile is 30 feet deep, three composite samples, one composite sample at each ten feet of depth, will be taken from 5 of the grids and one composite sample will be taken from a sixth, randomly chosen grid.

3 Add one sample for each additional 10,000 cubic yards.

6.7 Take the sample and submit it to the laboratory for analysis.

6.8. Statistically test the results of the sample analyses to determine how much uniformity the samples show and whether more samples must be taken.

6.9. If necessary, take additional samples and analyze. Continue to repeat steps 6.7 arid 6.8 until there are enough samples to characterize the pile.

6.10. As directed by the Field Team Leader, identify materials suitable for backfill or other purpose for which the sampling was done.

6.11. To compare the sample data with the desired criteria, calculate the average (X bar of all the samples) in the pile using:

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} xi$$

6.12 If the average satisfies the desired criteria, the results can be further evaluated to determine whether the data provide a 95 percent confidence level that the true mean (μ) meets the relevant criteria. The Field Team Leader will consult with the Project Coordinator to determine if this further evaluation is required.

7.0 IN-SITU SOIL SAMPLING

This section describes the methods for choosing sample locations and sampling methods.

7.1 Sample Location Selection

Appropriate in-situ soil sample locations are determined by the size and uniformity of the deposit being sampled. The sampling pattern depends upon the size of the area, the uniformity of the soil stratum being sampled, and the volume of soil that is being sampled.

Sampling plans for particular purposes may specify a pre-established sampling frequency in terms of the maximum volume of soil represented by a sample. If the soil being sampled is statistically homogeneous, then the locations for samples can be selected randomly over the area and thickness of the deposit. If the soil is not statistically homogeneous, then the area must be broken into sub-areas within which the soils are statistically homogeneous, and each area sampled separately. The issue of statistical homogeneity is resolved by comparing the range of variation of the property being judged to the acceptability criteria. For example, a deposit of sand and gravel may be statistically homogeneous when judged against a standard that the material not contain boulders and not be homogeneous when judged against a standard that no gravels be larger than one inch.

Clearly, also, the number of samples required to resolve the second comparison may be larger than the number required to resolve the first. The sampling frequencies given in the Sections 10.3 and 10.4 (Stockpile Sampling) may be used as a guide in estimating an initial number of samples, but the actual number required for a particular purpose depends very strongly upon the requirements and materials being sampled.

7.2 Drilling Procedures

No drilling is planned.

8.0 OPERATIONAL SUPPORT SAMPLING

Sampling may be required to support the excavation and restoration action. This sampling may be performed in instances when the Field Team Leader is interested in the significance of an observed variation or when looking for cursory information to provide operational guidance. The choice of the method will, therefore, depend on the specific goals of the sampling activity as determined by the Field Team Leader. This sampling is not a quality activity, and may be performed outside the requirements of this procedure. However, all deviations requested by the Field Team Leader must be documented in the Field Logbook by field personnel.

The sampling technique for surface sampling, subsurface sampling, and stockpile sampling, as described in this procedure, shall be used when sampling in these instances.

9.0 SAMPLE TRACKING

To establish the documentation necessary to track the sample from the time of collection, the sample identification and Sample Tracking Forms must accompany samples that are sent to the laboratory.

All potentially contaminated samples to be submitted to the laboratory will be screened for radiation in the field. Information obtained from this survey will be documented on the Sample Tracking Form (Form SOP 214-1). Samples taken from potential borrow areas generally are not screened.

10.0 SAMPLING METHODS

10.1 Surface Soil Sampling

10.1.1. If necessary, to minimize contamination, spread a clean sheet of plastic next to the area to be sampled; assemble the sampling equipment required.

10.1.2. Enter the complete information on the Sample Tracking Form:

- Sample Number
- Sample Matrix
- Sample Location
- Purpose of Sample Collection
- Include applicable comments regarding the sample, location, weather, conditions, or other factors that may be relevant
- Collected by (your name)

10.1.3. Mark the collection bag or prepare the identification tag for the sample.

10.1.4 Collect the soil samples that are representative of the soil in the area surveyed. Use a shovel or trowel to collect soil from the depth required.

10.1.5 Remove rocks, sticks, and foreign objects greater than approximately one-quarter (1/4) inch.

Stir and homogenize the soil in a bucket as much as practicable. Using the hand trowel, randomly scoop the soil from the bucket. Saving each of the scoops of material to collect the required sample size; return the other material to the sampling locations.

10.1.6 Attach the identification tag to the sample bag if appropriate and place the bag in the sample container.

10.1.7 Decontaminate the sampling equipment as required by Section 11.

10.1.8 Return any location markers (such as pin flags) that, were removed in order to sample. Fill in all sampling holes to eliminate a possible tripping hazard.

10.1.9 If specific data are not available, mark a pin flag with the sample identification number and place the flag at the center of the sampling location before leaving.

10.2 Subsurface Sampling (Undisturbed Soils)

10.2.1 If necessary, to minimize contamination, spread a clean sheet of plastic next to the area to be sampled; assemble the sampling equipment required.

10.2.2 Enter the complete information on the Sample Tracking Form

- Sample Number
- Sample Matrix
- Sample Location
- Purpose of Sample Collection
- Include applicable comments regarding the sample, location, weather, conditions, or other factors that may be relevant
- Collected by (your name)

10.2.3 Mark the collection bag or prepare the identification tag for the sample.

10.2.4 Sample the material using a hand core sampling tool or hammer driven split spoon sampler.

Alternatively, an auger method may be used.

Cut a hole, approximately six (6) inches in diameter, in the center of a plastic sheet. Center the sheet of plastic over the area to be sampled. Using an auger, drill through the hole in the plastic to the desired sampling depth; keep the auger turning until no more material comes up. The soil around the hole, on the plastic sheet, is fairly well mixed and representative of the interval just drilled.

If the soil sample is to be obtained from a particular depth (not a composite from surface to depth), and the material refuses to pass into the coring tool, the following sampling method will be performed. Drill through the hole in the plastic to the top of the desired sampling depth; keep the auger turning until no more material comes up. Remove the auger and sample the material using a hand core sampling tool or hammer driven spilt spoon sampler. The few inches of the sample obtained may constitute sidewall slough and should not be part of the desired sample. The sample(s) should be collected over six-inch intervals starting below the slough material.

NOTE: If, due to the conditions of the sampling area, this method does not work, an alternative method(s), approved by the Field Team Leader, may be used. Alternative methods, when used, will be documented by the field personnel in the Field Logbook.

10.2.5 Remove rocks, sticks, and foreign objects greater than approximately one-quarter (1/4) inch in diameter.

NOTE: The removed rocks will be collected and submitted as a separate sample.

10.2.6 Using a hand trowel, collect approximately one (1) quart of the augured soil in the plastic sample bag or jar. For core segments, place each 6-9 inch (nominally 5-7 inch) segment in the plastic sample bag or jar.

10.2.7 Label the sample container.

10.2.8 Return unused material to the sampling hole and fill in the hole to eliminate possible tripping hazard.

10.2.9 Decontaminate the sampling equipment as required by Section 11.

10.2.10 When required, mark a pin flag with the sample identification number and place the flag at the center of the sampling location before leaving.

10.3 Stockpile Sampling (Core Sampling Method)

10.3.1 If necessary, to minimize contamination, spread a clean sheet of plastic next to the area to be sampled and assemble the sampling equipment required.

10.3.2 Enter the complete information on the Sample Tracking Form:

- Sample Number
- Sample Matrix
- Sample Location
- Purpose of Sample Collection
- Include applicable comments regarding the sample, location, weather, conditions, or other factors that may be relevant. Identify the approximate size of the stockpile. (A 70 cubic yard pile of soil is approximately ten feet high with a base diameter of

approximately 26 feet.) Include a brief description of the equipment used to obtain the sample (i.e., sub-soil sampler, drill rig, etc.).
- Collected by (your name)

10.3.3 Before sampling, determine the number of grids and samples as described in Section 6.6. Record the information in the Field Logbook.

10.3.4 Mark the collection bag or prepare the identification tags for the samples.

10.3.5 Using an auger or other coring tool, take the required number of samples from the pile. A hollow stem auger will be used when discrete, rather than composite, samples are collected.

10.3.6 Place the sample material in the sample bag and attach the identification tags. Place the sample bag in the container.

10.3.7 Decontaminate the sampling equipment as required by Section 11.

10.4 Stockpile Sampling (Lift Sampling Method)

10.4.1 If necessary, to minimize contamination, spread a clean sheet of plastic next to the area to be sampled and assemble the sampling equipment required.

10.4.2 Enter the complete information on the Sample Tracking Form:

- Sample Number
- Sample Matrix
- Sample Location
- Purpose of Sample Collection
- Include applicable comments regarding the sample, location, weather, conditions, or other factors that may be relevant. Identify the approximate size of the stockpile. (A 70 cubic yard pile of soil is approximately ten feet high with a base diameter of approximately 26 feet.) Include a brief description of the equipment used to obtain the sample (i.e., sub-soil sampler, drill rig, etc.).
- Collected by (your name)

10.4.3 Before sampling, determine the number of grids and samples as described in Section 6.6. Record the information in the Field Logbook.

10.4.4 Mark the collection bag or prepare the identification tags for the samples.

10.4.5 Using the appropriate sampling tool, take the required number of samples from the lift approximately perpendicular to the surface of the lift at the appropriate locations. Composite the sample through the entire lift thickness.

10.4.6 Place the sample material in the sample bag and attach the identification tags. Place the sample bag in the container.

10.4.7 Decontaminate the sampling equipment as required by Section 11.

10.5 Soil Sample Size

10.5.1 Samples collected for NUTRANL analysis used for EPA confirmation shall consist of a batch of five 20 milliliter bottles of soil. If split samples are to be obtained, approximately 1.5 liters shall be collected. Sample size requirements are detailed in Sample Preparation Procedure for Gamma Spectral Analysis (SOP-364).

11.0 EQUIPMENT CLEANING

To avoid cross-contamination, the sampling equipment will be cleaned prior to and between samples. The following steps will be followed to clean equipment.

- Remove loose contamination by gently tapping/shaking the item.
- Using the stainless steel brush or paper towels, remove material that did not dislodge.
- If the item appears to be clean (i.e., no visible clinging soil), proceed to the next sampling area.
- If the item does not appear to be clean or if a survey with the appropriate instrument does not verify that it is, scrub the item with water. While holding the item over the sampling location, rinse the item with water.
- Dry the item with paper towels or repeat the scrubbing sequence as necessary.
- Rinse gloved hands. Change gloves when changing sampling areas if a self-frisking indicates that contamination is present after rinsing.
- Approximately one percent of the time, swipe the item as described in the Gamma Radiological Survey SOP (SOP-210). Submit the swipes to the laboratory for analysis to confirm the effectiveness of the decontamination protocol. (This step is necessary only when sampling soils where radiologic contamination is suspected.)
- Dispose of cleaning materials, plastic sheeting, and gloves as contaminated materials in accordance with instructions provided by the Field Team Leader.

12.0 QUALITY CONTROL

12.1 Quality Control Samples

To evaluate the variance in the soil sampling protocol, field duplicates will be collected at specified intervals. These quality control (QC) samples will be identified and noted in the Field Logbook.

To validate the sampling protocol used for surface sampling, initially one (1) area on every twenty (20) sub-grids sampled.

For surface sampling, the duplicates shall be randomly selected and identified before sampling activities begin. The duplicate sample material will be collected using the next scoop full of material each time the initial sample is saved.

For subsurface samples, one duplicate subsurface sample will be taken for every twenty (20) samples.

For subsurface sampling, the duplicate will be collected from the representative augered material.

For stockpiles, one duplicate will be taken for every twenty (20) stockpile samples, or one each day that stockpile sampling takes place, whichever is greater.

The stockpile duplicate will be taken from the node of two grids. The duplicates will be randomly selected and identified before the sampling begins.

The Field Team Leader will calculate the mean and the standard deviation for the samples analyzed. If the duplicate sample results are within three (3) standard deviations of the sample population, the sampling protocols can be considered acceptable.

If the Project Coordinator approves, the Field Team Leader can reduce the frequency of the QC duplicate sampling based on the results obtained. Changes shall be documented in the Field Logbook.

12.2 Data Review

Entries in the Field Logbook will conform to the Field Logbook Standard Operating Procedures.

Daily, the Field Team Leader will review the Field Logbook, resolve any discrepancies that were noted by field personnel, and sign the book to indicate the pages reviewed. If the Field Team Leader recorded the discrepancy, the Quality Assurance Supervisor will review the Field Logbook and resolve any discrepancies that were noted.

NOTE: Discrepancies relating to reported data will be brought to the attention of the Field Team Leader.

13.0 HEALTH AND SAFETY

Personal protective equipment and clothing, as required by the Health and Safety Plan, will be used when collecting and handling contaminated soils.

The site radiological conditions will be determined and documented before sampling begins. During the sampling process, the principles of As Low As Reasonably Achievable (ALARA) will be followed.

14.0 RECORDS

The following documents will be maintained as quality records:

- Field Logbooks
- Sampling Tracking Forms
- Results of all Calculations and Statistical Analyses Performed

FORM SOP-214-1

SAMPLE TRACKING FORM

Date: _____ Page _____ of _____

Sample Number	Matrix (S/W)	Location	Collected For	Comments	Collected By
Released by/company			All samples listed above are hereby released except for:		Date/Time
Received by/Company			All samples listed are hereby received except for:		Date/Time
Received by/Company			Data for all samples listed above are hereby received except for:		Date/Time

FORM SOP-214-2

FIELD SAMPLE SCREENING FORM

Sample Type:	Sample ID Number:
Date:	Time:
Counting Instrument:	Sample Date:
Reading Units:	
Signature of Technician:	Date:
Signature of Reviewer:	Date:

EXCAVATION PROCEDURE

1. PURPOSE

To provide a procedure for excavation for the Site.

2. SCOPE

This procedure will cover Site excavation activities, which are deemed quality critical by the Project Coordinator

3. REFERENCES

1992, NUREG/CR-5849, Manual for Conducting Radiological Surveys in Support of License Termination, Draft Report.

4. EQUIPMENT AND MATERIAL

None

5. INSTRUCTIONS

5.1 Delineation of extent

5.1.1 Delineate initial areas and depths. Areas and depths will extend slightly beyond estimated extent of impacted soil. Initial areal extent will be established using previously completed walkover gamma surveys and down-hole exploration and sampling information, supplemented with gamma survey data.

5.1.2 Initial excavation limits to be within three inches of the estimated bottom limit.

5.2 Excavate delineated soil mass.

5.3 Sampling scheme

5.3.1 Re-establish survey grid.

5.3.1 Locate diagonals across grid square.

5.3.2 Survey the bottom of the excavation as described in SOP-210.

5.4 Pre-Verification or Verification Sampling

5.4.1 If all measurements within a grid are less than the cleanup criteria limit, then grid is clean. No further excavation is required in this grid.

5.4.2 If any measurements within an excavation are greater than the action criteria limit, then additional excavation is required.

5.4.2.1 Proceed through sequence 5.2 through 5.4 again.

5.4.2.2 Mark subareas around grid points that exceeded the action limit.

5.4.2.2 Contact Field Team Leader for guidance of additional excavation.

5.5 Completion

5.5.1 After grid has met criteria, give documentation of delineation, excavation, and sampling to Field Team Leader.

5.5.2 Grid is available for Pre-Verification or Verification Surveying.

6. QUALITY CONTROL

6.1 Quality control for the excavation documentation will be in accordance with applicable SOPs.

VERIFICATION SURVEY PROCEDURE

1.0 PURPOSE

The purpose of this procedure is to present protocol for conducting verification surveys at the excavations at the Site.

2.0 SCOPE

This procedure applies to all completed excavations that are done as a result of the excavation area being identified as containing soil exceeding the cleanup criteria.

3.0 REFERENCES

SOP-210 - Gamma Radiological Survey

4.0 EQUIPMENT AND MATERIALS

None

5.0 PROCEDURE

5.1 Equipment and Materials

Equipment used for verification survey may include the following:

5.1.1 Compass or theodolite

5.1.2 Cloth or steel tape

5.1.3 Stakes, survey flags, or spray paint

5.2 Grid Layout

5.2.1 The verification survey will be conducted at all excavations.

5.2.2 The grid used for the STS Survey, or similar locations will be re-established for the verification survey.

5.2.3 The diagonals across each grid square will be located.

5.2.4 The location halfway between the grid corner and the center of the grid will be located.

5.3 VERIFICATION

5.3.1 Measurements will be made according to the procedures described for Gamma Radiological Surveys (SOP-210).

5.3.2 If all measurements within a grid are less than the cleanup criteria limit, then grid is clean. No further excavation is required in this grid.

5.3.3 If any measurements within an excavation are greater than the action criteria limit, then the Field Team Leader shall guide additional soil removal until the excavation measures below the cleanup criteria.

6.0 DOCUMENTATION

6.1 A scale drawing of the survey area showing the locations and results of the gamma measurements will be created.

6.2 The drawing and gamma measurements will be delivered to the USEPA with a Notice of Successful Verification and a request for approval to backfill the excavation (Form SOP 223-1).

7.0 QUALITY CONTROL

7.1 Quality control for the verification documentation will be in accordance with applicable SOPs.

FORM 223-1
NOTIFICATION OF SUCCESSFUL VERIFICATION SURVEY

Area Identification: _____

Date of Verification Survey: _____

Time of Verification Survey _____ am/pm

The above-described excavation was surveyed at the time and date indicated above. The survey indicated that all soils have been removed as required by the Site Removal Action Criteria.

Documents pertaining to this survey are attached for review and approval by the USEPA.

Signed: _____

Date: _____

Print Name: _____

Print Title: _____

STS Consultants, Ltd.

The attached Verification Survey documents were reviewed by USEPA, Region 5 on _____. The results of this survey indicate that the verification criteria as contained in the UAO, have been met.

Authorization is hereby granted to commence backfill and restoration work at this excavation.

Date _____

Print Name _____

Print Title _____

For USEPA Region 5

DUSABLE PARK

STANDARD OPERATING PROCEDURE

Title: Radioactive Material Shipments

Document: SOP-320

Revision Number: 0

Date: October 5, 2007 Replaces: New

RADIOACTIVE MATERIAL SHIPMENTS

1.0 SCOPE

1.1 Purpose

To establish a procedure that will insure the safe and proper shipment of radioactive waste material in compliance with USEPA, NRC, and DOT regulations. The procedures will be modified as necessary to meet the compliance requirements in force at the time of shipment. It is anticipated that manifesting, transportation and disposal of these radioactive materials is the responsibility of Tronox.

1.2 Applicability

This procedure is applicable at all times for LSA shipments of radioactive materials destined for disposal at Energy Solutions Clive Facility (fka Envirocare), located in Clive, Utah.

2.0 REFERENCES

- 32 Illinois Administrative Code, Parts 310 and 340, Standards for Protection Against Radiation
- 32 Illinois Administrative Code, Part 400, Notices, Instructions and Reports to Workers; Inspections
- Parcel K and Parcel 21 Health and Safety.
- 10 CFR Part 20.1906
- 10 CFR Part 71.47 and 71.87
- 10 CFR Part 71 Statements of Consideration
- 49 CFR Parts 172, 173, 174 and 177
- 32 Illinois Administrative Code, Part 341, Transportation of Radioactive Material
- Utah Radioactive Material License No. SMC-1559 with current amendments issued to Energy Solutions Clive Facility (fka Envirocare).

3.0 DEFINITIONS

3.1 Definitions for transport are defined in 49CFR §171.108

This is the maximum activity of special form radioactive material permitted in a Type A package.

3.2 Limited Quantity of Radioactive Material

This is the quantity of radioactive material that does not exceed the materials package limits specified in 49 CFR 173.425 and which conforms with the requirements specified in 49 CFR 173.421.

4.0 REQUIREMENTS

4.1 Prerequisites

4.1.1 A copy of the consignee's up-to-date radioactive material license shall be on file at the Tronox (fka Kerr-McGee) West Chicago facility office so the Site Manager or his designee can verify that the consignee is licensed to receive the radioactive material.

4.1.2 All containers shall be inspected by the Project Coordinator or designee prior to loading and palletizing, to insure that the container's integrity is adequate, and then inspected again to insure that the containers have been loaded and closed in accordance with applicable procedures.

4.1.3 For shipments of radioactive material for disposal, compliance with disposal site facility criteria and specific state and federal license provisions applicable to the material shall be verified by Project Coordinator.

4.1.4 For packages of radioactive waste material intended for shipment to Energy Solutions Clive Facility (fka Envirocare) for disposal, the Project Coordinator or designee shall verify that the pre-shipment characterization process has been completed.

4.2 Tools, Material, Equipment

4.2.1 Calculator.

4.2.2 Packaging, labels and containers

4.3 Precautions Limits

4.3.1 Radioactive waste material that is to be shipped for disposal must be classified according to 32 IAC 340.1052 and meet the requirements of 32 IAC 340.1055.

4.3.2 The maximum permissible limits for removable contamination for a package:

Contaminant	Bq/cm^2	$\mu Ci/cm^2$	Dpm/cm^2
Beta/gamma emitting nuclides; nuclides with $T_{1/2}$ <10 days; natural uranium; natural thorium; U-235; U-238; Th-232; Th-228; and Th-230 when contained in ores or physical concentrates.	0.4	10^{-5}	22
All other alpha emitting nuclides	0.04	10^{-6}	2.2

NOTE: In cases of packages transported as exclusive use shipments by rail or highway, the non-fixed radioactive contamination must not exceed the above limits at the beginning of transport, and, at any time during transport, must not exceed 10 times the above limits.

4.3.3 The radiation levels at any point on the external surface of the package must not exceed 200 mrem/hr and the Transport Index must not exceed 10. Packages transported as exclusive use by rail or highway may exceed these limits provided that the following conditions are met:

	Open Vehicle	Closed Vehicle
Package Surface	≤ 200 mrem/hr	≤ 1000 mrem/hr
Vehicle	≤ 10 mrem/hr at 2 meters from vertical planes	≤ 200 mrem/hr at any point on the outer surface of the vehicle ≤ 10 mrem/hr at 2 meters from vertical planes ≤ 2 mrem/hr in cab

4.4 Acceptance Criteria

4.4.1 Radioactive material has been properly prepared, packaged, marked, labeled, and loaded onto a vehicle and is in proper condition for transport.

4.4.2 All necessary forms, surveys, and manifests have been prepared and the "shipping papers" packet is complete.

4.4.3 All necessary state and local authorities and material receivers have been properly notified of the shipment.

4.4.4 All necessary paperwork has been completed and signed and a copy of the "shipping papers" packet has been filed for Kerr-McGee's records.

4.4.5 For *radioactive* waste shipments for disposal, confirmation of receipt at the disposal facility is acknowledged within 20 days of shipment, or an investigation is initiated.

5.0 PROCEDURE

5.1 Verify that the intended consignee (receiver) of the material has a valid license to accept the type and quantity of radioactive material.

NOTE

Typically, groundwater samples, surface water samples, and environmental air samples that are shipped offsite do not meet the regulatory definition of "Radioactive Material" and therefore do not require radioactive material shipping paperwork.

5.1.1 The A_1 and A_2 values for radionuclides are the limits in curies from which a shipment type is determined.

5.2 Determine the following information for inclusion on the bill of lading ***and/or the radioactive waste shipment and disposal record*** form for each package in the intended shipment:

5.2.1 Proper shipping name and hazard class from 49 CFR 172.101, Columns 2 and 3.
5.2.2 Proper UN identification number from 49 CFR 172.101, Column 3.a.
5.2.3 Principal radionuclides (greater than 1% of total activity).
5.2.4 Determine whether or not Reportable Quantity (RQ) must appear on the bill of lading per 49 CFR 172.203(c)(2)

a. Using Table 2 of Appendix to 49 CFR 172.101, determine if a single radionuclide exists as a reportable quantity.
b. If a mixture of nuclides exists, use the sum of the ratios of the quantity of a nuclide per package and the RQ for the nuclide. A package contains an RQ of a hazardous substance when the sum of the ratios is ≥ 1.
c. If the quantities or identities of some of the nuclides in a package are unknown, follow the instructions found in the Appendix to 49 CFR 172.101 step 6 for RQ determination. .

5.2.5 Physical and chemical form of material.

5.2.6 Net quantity (activity) in each package.

5.2.7 For each shipment of radioactive material, emergency response information must be maintained during transportation and at facilities where hazardous materials are loaded for transportation or otherwise handled during any phase of transportation.

a. Emergency response information is not required for shipments of radioactive materials excepted from the shipping paper requirements of subchapter C of 49 CFR, such as those shipments designated as limited quantity.

b. Complete Emergency Response Information form (Attachment 2) and include with the shipping papers for the radioactive material shipment.

5.3 If the package of radioactive material is to be shipped for disposal, the following are additional required steps:

5.3.1 Use Radioactive Waste Shipment Checklist (Attachment 3) for shipments to a disposal facility.

5.3.2 Verify that the radioactive waste material has been classified in accordance with 32 IAC 340.1052.

5.3.3 Verify that the package's records meet the radwaste material form requirements of 32 IAC 341.1055.

5.3.4 Use Energy Solutions Clive Facility's (fka Envirocare) Radioactive Waste Shipment and Disposal Record form 540 and 541 as the manifest form for all shipments of radioactive waste material going to Energy Solutions Clive Facility (fka Envirocare).

5.3.5 Mail or otherwise send, separate from the shipment, a copy of the disposal site shipping manifest to the disposal facility operator. This copy of the shipping manifest may be sent the same day that the shipment leaves tile site.

5.3.6 The disposal site operator is required to acknowledge receipt of the shipment within seven (7) days of arrival by returning a signed copy of the first page of the shipping manifest to the shipper.

5.4.7 Verify and document on the Radioactive Waste Shipment Checklist. (Attachment 3) that the return receipt for the shipment has been received within 20 days of shipment.

For shipments whose receipt has not been acknowledged within 20 days, initiate a trace investigation in accordance with 32 IAC 340.1060(h).

5.4 For packages shipped by rail or highway under the "EXCLUSIVE USE" provisions of 49 CFR 173.403 (i), the following additional steps are required:

5.4.1 Verify, that the certification statement of 49 CFR 172.204: "This is to certify that the above-named materials are properly classified, described, packaged, marked, and labeled, and are in proper condition for transportation according to the applicable regulation of the Department of Transportation," appears on the shipping paper, and is signed by the Project Coordinator, or his designee.

5.4.2 If a Radioactive Yellow II label is required, record the package contents (radionuclides), number of curies, and Transport Index (TI) on the label. Affix label to two opposite sides of the package (excluding the bottom) near the proper shipping name.

5.4.3 Verify that the radioactive material has been properly prepared, packaged, marked, labeled, and loaded on the vehicle.

5.4.4 Ensure that package radiation and contamination surveys have been performed and documented, and that package radiation and contamination levels are within the limits specified in Section 4.3.

5.4.5 Ensure that the vehicle has been completely tarped, blocked and braced, or the packaged material sufficiently restrained to preclude movement within the vehicle during normal transport.

5.4.6 Ensure that the vehicle or rail car is properly placarded and marked per Subpart D and F of 49 CFR 172. If placarding is required and shipment is by vehicle, all four sides must

have placards.

5.4.7 Verify that a radiation survey of the loaded vehicle has been performed and documented on Shipment Load Diagram (Attachment 5).

5.4.8 Complete Form Exclusive Use Vehicle Instructions to Carrier (Attachment 6), and have the vehicle operator read the exclusive use statement and acknowledge compliance his or her signature, and include a signed copy with the shipping papers.

5.4.9 Contact the Project Coordinator, or his designee, for final inspection of the vehicle, cargo and paperwork.

5.4.10 Insure that the carrier (vehicle operator) has all the required shipment papers, and appropriate copies have been retained for the site files.

5.5 For packages shipped as other than exclusive use, ensure completion of the following:

5.5.1 Certification statement of 49 CFR 172.204: "This is to certify that the above-named materials are properly classified, described, packaged, marked, and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation," appears on the shipping paper and is signed by the Project Coordinator or his designee.

5.5.2 Package external radiation level is less than 200 mR/hr contact and 10 mR/hr at one meter.

5.5.3 Package external contamination level does not exceed 2200 dpm/100 cm^2 β and 220 dpm/100 cm^2 α

5.5.4 If the radiation level on the external surface of the package is greater than 0.5 mR/hr and less than 50 mR/hr, and the radiation level at 1 meter is less than 1 mR/hr the package may be shipped as a Radioactive Yellow II shipment.

Ensure that the shipping container meets the DOT Specification 7A Type A general packaging requirements per 49 CFR 173.415.

5.5.5 If a Radioactive Yellow II label is required, record the package contents (radionuclides), number of curies, and TI on the label. Affix label to two opposite sides of the package (excluding the bottom) near the proper shipping name.

5.5.6 Package is marked correctly in accordance with 49 CFR 172 Subpart D.

5.5.7 Ensure vehicle radiation and contamination surveys have been performed.

5.5.8 Placarding requirements in Subpart F of 49 CFR 172 are met.

5.5.9 Final inspection of the vehicle, cargo, and paperwork is performed by Project Coordinator, or his designee.

5.5.10 For radioactive waste shipments, the disposal facility operator is required to acknowledge receipt within one week by returning a signed copy of the manifest.

6.0 RECORDS/REPORTS/NOTIFICATIONS

6.1 Shipping records shall be maintained by the Project Coordinator. A complete shipment record packet includes copies of all completed and signed paperwork that accompanied the shipment.

6.2 Anyone who observes a deficiency in complying with this procedure shall notify Project Coordinator or his designee.

7.0 ATTACHMENTS

7.1	Attachment 1	Example Bill of Lading-Short Form (for Exclusive Use)
	Attachment 1A	Example Bill of Lading – Short Form for Material>2 N/gm <RQ
	Attachment 1B	Example Bill of Lading – Short Form for Material >2 N/gm >RQ
7.2	Attachment 2	Emergency Response Information Form
7.3	Attachment 2A	Emergency Procedure Form
7.4	Attachment 2B	Evaluation Questionnaire Form
7.5	Attachment 3	Radioactive Waste Shipment Checklist
7.7	Attachment 5	Shipment Load Diagram - Truck
7.8	Attachment 6	Exclusive Use Vehicle Instructions To Carrier

ATTACHMENT 1

STRAIGHT BILL OF LADING - SHORT FORM

ATTACHMENT 2

EMERGENCY RESPONSE INFORMATION

Shipment I.D. No. _____

1. Proper Shipping Name and Hazard Class
Check one of the two types listed below

☐ Radioactive Material, Low Specific Activity, n.o.s. - Radioactive Material UN 2912

☐ Radioactive Material, n.o.s. - Radioactive Material UN 2982

DRIVER EMERGENCY PROCEDURE

A) RESCUE and LIFESAVING may be done with little fear of the hazards from the cargo on this truck. If possible, avoid breathing dust from any spilled cargo.

DO NOT DELAY RESCUE EFFORTS!

B) After providing needed rescue, lifesaving, first aid or fire-fighting, please read the attached instructions in the event of cargo spillage.

TO THE DRIVER:

Keep these emergency procedures with your shipping papers.

By my signature I certify that I have read and understand these emergency procedures.

Driver's Signature: _____

ATTACHMENT 2A
EMERGENCY PROCEDURE

This vehicle contains soil or debris, which are contaminated with natural thorium. In the event of an accident involving spillage of radioactive material, the following actions are recommended, if appropriate:

1. LIFESAVING, RESCUE AND FIREFIGHTING

This may be done with little fear towards the hazards from the debris contaminated with thorium. If possible, avoid breathing dust and avoid swallowing it. Thorium on the skin or clothing is relatively harmless and simple washing methods will remove it. If you come into contact with the debris, please wait for advice from health officials. To avoid ingestion of thorium, do not eat, drink, or smoke while near the spill.

2. CONTACT THE LOCAL LAW ENFORCEMENT AGENCY

Tell the police of the accident with spillage of "LOW SPECIFIC ACTIVITY" (LSA) radioactive material called natural thorium. Ask them to notify the state health department. Give them the location of the accident site and tell them of any injuries to persons.

3. FILL OUT ATTACHED QUESTIONNAIRE

Please obtain all of the information asked for on the attached form. You will need to relay this information to the carrier and the shipper.

4. Telephone the Carrier and Shipper (call collect)

   a) The Trucking Carrier is: _____
   Telephone No.: _____

   b) The Shipper is:
   Telephone No. _____

Read the completed questionnaire to whoever answers your calls. It may be necessary to read the questionnaire a second time for complete understanding.

5. When help arrives please cooperate with all Civil Authorities and Carriers and Shipper's personnel who arrive at the scene. Follow their health safety instructions for checking possible contamination of your clothing or body.

   Please be assured that your exposure to this material will be relatively harmless, particularly if you have followed these instructions. The health and safety personnel who will arrive will be glad to answer any questions you have about this matter

ATTACHMENT 2B
EVALUATION QUESTIONNAIRE

1. Name of truck driver

2. Name of trucking company _____

3: Bill of lading number

4. Destination of shipment _____

5. Date and time of accident _____

6. Place of accident _____

7. Name of Police Department notified _____

8. Phone Number of Police notified _____

9. Is the driver injured? _____ Others? _____

10. Is or was there a fire? _____

11. Is the truck road worthy? _____

12. Are boxes off of the truck? _____ How many? _____

13. Estimate the number of square feet of spilled material _____

14. Has the spill been covered? _____

15. Is the spill on the ground? _____ Pavement? _____

16. Is the spill in water? ☐ Yes ☐ No **Lake**? ☐ Yes ☐ No **Stream**? ☐ Yes ☐ No

17. Is the spill near a building? ☐ Yes ☐ No **Sewer**? ☐ Yes ☐ No

18. Is the accident place illuminated at night? _____

19. Other comments: _____

20. Where can you be reached by phone? _____

a) Near the accident site _____
b) Home or business phone _____
c) Your name: _____

ATTACHMENT 3
RADIOACTIVE WASTE SHIPMENT CHECKLIST

DATE _____ BY _____

SHIPMENT NO._____ CONSIGNEE _____

NOTE: Initial each statement as being completed or fill in the blank with appropriate comment(s). N/A is acceptable for those steps not required for this particular shipment.

_____ 1. General description
_____ 2. Consignee license reviewed and consignee authorized to receive type and quantity of material in shipment.
_____ 3. Number of packages in shipment. (Indicate number of packages of each type of waste.)
_____ 4. All containers inspected by Project Coordinator, or designee, to ensure compliance with all applicable laws, rules and regulations, including labeling, obliteration of old markings, radwaste classification/stability, gross weight, and package specifications.
_____ 5. A determination has been made whether or not any package in this shipment is a Reportable Quantity.
_____ 6. If this is an "Exclusive Use" shipment, the packages are loaded and blocked and braced or otherwise restrained to prevent movement.
_____ 7. Placard the vehicle per Subpart F of 49 CFR 172. For tractor-trailers, placard each side of the trailer and place one on the front of the tractor. For rail shipments, a placard must be visible on each side of a rail car not coupled to another car.
_____ 8. If applicable, the required tamper proof seals are installed.
_____ 9. EMCCs Straight Bill of Lading- Short Form, (Attachment 1, 1A or 1B) has been completed. Normal copy distribution if applicable is as follows:

a. Project files.
b. With shipment. Note: if radwaste material, the copy goes in the disposal site paperwork package.
c. With driver paperwork package.

NOTE: The following step applies to shipments for disposal at the Energy Solutions Clive Facility (fka Envirocare) only.

_____ 10. The Energy Solutions Clive Facility's (fka Envirocare) Radioactive Waste Shipment Record, is complete.

Copy distribution:

a. Original with shipment paperwork package.
b. Copy to project files.

_____ 11. The "EXCLUSIVE USE" Vehicle Instructions to Carrier, (attachment 6); his been completed.

Copy distribution:

a. Original with driver's paperwork package.
b. Copy with shipment paperwork package.
c. Copy to WCP Project files.

_____ 12. Radiation surveys have been performed.

Copy distribution:

a. Original to project files.

_____ 13. Receipt of radwaste material has been acknowledged by the disposal site operator within allotted time (10 days).

Copy distribution:

a. One copy to project files

_____ 14. Vehicle check performed.

Reviewed by: _____ Date _____
Project Manager or Designee

ATTACHMENT 5

SHIPMENT LOAD DIAGRAM - TRUCK

SHIPPER_____ CAB NUMBER_____ TRAILER NUMBER_____
SURVEY BY _____ SHIPMENT N0. _____ DATE _____

TRUCK CHECKED FOR CONTAMINATION:

BEFORE LOADING: ☐ < 02200 dpm/100 cm^2 beta-gamma ☐ < 220 dpm/100 cm^2 alpha

☐ CONTAMINATED TO_____

RADIATION LEVEL, MR/hr_____ CONTAMINATION LOCATION _____

AFTER LOADING: ☐ < 02200 dpm/100 cm^2 beta-gamma ☐ < 220 dpm/100 cm^2 alpha

Cab _____ mR/hr
(Sleeper)

Front of Van

Surface _____ mR/hr

6' _____ mR/hr

Left Side

Surface _____ mR/hr

6' _____ mR/hr

Right Side

Surface _____ mR/hr

6' _____ mR/hr

Top of Truck

Surface _____ mR/hr

6' _____ mR/hr

Under Truck

Surface _____ mR/hr

Rear Surface _____ mR/hr

6' _____ mR/hr

ATTACHMENT 6
"EXCLUSIVE USE" VEHICLE INSTRUCTIONS TO CARRIER

SHIPMENT NO. _____ Date _____

1. This shipment of radioactive material is being transported as an EXCLUSIVE USE shipment, loaded by the consignor and may only be unloaded under the direction of the consignor or consignee [49 CFR 173.403 (i)].

2. Any removal, addition to, or movement of, any material in this shipment by anyone, except under the direction of the consignee or consignor, shall constitute a violation of federal law.

3. A closed van shipment shall not be opened, nor shall any shipment be changed or modified in any manner, except by the consignee, without the prior authorization of Kerr-McGee Chemical LLC. No change of tractor is authorized without prior approval of Kerr-McGee Chemical LLC. Do not move the 5th wheel of the tractor once the shipment has left the Parcel K and Parcel 21 site.

In the event of an emergency, accident, or contemplated deviation from any the above instructions, notify Kerr-McGee Chemical LLC at _____. Routine inspection of placarding is required at all "off the road" stops.

Signature _____ Date _____

CARRIER ACKNOWLEDGEMENT:

I have read and understand the foregoing instructions. I agree that this shipment will be made in full accordance with these instructions.

Signature _____ Date _____

Print Name _____

DECONTAMINATION

1.0 SCOPE

1.1 Purpose

The purpose of this procedure is to provide instructions for the decontamination of personnel and equipment.

1.2 Applicability

This procedure is applicable for all equipment and personnel that may become contaminated at the Parkview West site.

2.0 REFERENCES

10 CFR Parts 19 and 20

U. S. Nuclear Regulatory Commission (USNRC) Regulatory Guide 1.86

Health and Safety Plan, Parcel K and Parcel 21 Radiologically Impacted Soil Removal Action, Chicago, Illinois

SOP-345 "Surveys for Surface Contamination and Release of Equipment for Unrestricted Use"

3.0 DEFINITIONS

3.1 Airborne Radioactivity Area

This term defines radiation conditions within a specified area. An area where the average concentration of airborne radioactivity could allow an individual to exceed 12 DAC-hrs over a one week period.

3.2 Clean Area

This term defines radiation conditions within a specified area. An area where the radiation levels and contamination levels are maintained below 2 mrem/hr and 33 dpm/100 cm^2 alpha respectively.

3.3 Contamination Control Area

This term defines radiation conditions within a specified area. An area that may be contaminated to a level greater than a Clean Area.

3.4 Contamination Reduction Zone

The area on one side of the Control Line where personnel can decontaminate, remove their personal protective clothing and equipment.

3.5 Control Line

The demarcation that separates a Clean Area from a Contamination Control Area. The control line is located in the personnel decon facility.

3.6 Craft Personnel

Employees and contractors who physically perform the activities described on the SWP.

3.7 Derived. Air Concentration-Hour (DAC-hour)

DAC-hour is the product of the concentration of radioactive material in air and the time of exposure to that radionuclide.

3.8 Exclusion Zone

The area on one side of the Control Line that includes Contamination Control Areas, Radiation Areas, and Airborne Radioactivity Areas.

3.9 Film Badge

Similar to the TLD, it is used to measure radiation dose.

3.10 Frisking

A personal survey of an individual's clothing and exposed body performed to determine if contamination is present.

3.11 Protective Clothing

Reusable or disposable coveralls, boots and gloves that provide a barrier between contamination and personnel.

3.12 Radiation Area

This term defines radiation conditions within a specified area. An area where the whole body radiation level is greater than 5 mrem/hr.

3.13 Special Work Permit (SWP)

A document which describes the radiological conditions of the work area or task and delineates safety and radiation protection requirements to be followed in the work area or when performing the task.

3.14 Support Zone

The area on one side of the Control Line at the entrance to the Exclusion Zone.

3.15 Optically Stimulated Luminescence Dosimeter (OSL)

A device that measures radiation dose.

4.0 REQUIREMENTS

4.1 Prerequisites

None.

4.2 Tools, Material, Equipment

4.2.1 Decontamination facility.

4.2.2 Soap, water, high pressure spray, scrub brushes and other material as necessary to decontaminate personnel and equipment.

4.3 Precautions, Limits

Decontamination of personnel with material other than soap and water will only be done when authorized by the Site Manager, Health Physics Supervisor, or a medical doctor.

4.4 Acceptance Criteria

4.4.1 Personnel shall be free of contamination after decontamination.

4.4.2 Material and equipment being decontaminated, for unrestricted release, shall meet the release limits established in Reference 2.4.

5.0 PROCEDURE

5.1 Personnel Decontamination

5.1.1 Personnel who are contaminated to greater than 100 ccpm shall notify the health physics technician (HPT) assigned to the Control Line.

5.1.2 The HPT shall resurvey the individual to determine the exact location of the contamination and document it on the Contaminated Personnel or Personal Effects Report (Attachment 1).

5.1.3 If the contamination is spotty, the HPT shall attempt to decontaminate the individual using swabs or soap and water. If the decontamination is successful, document the results on Attachment 1.

a. If contamination is determined to be in an individual's eyes, the eyes may be flushed, using an eye wash station.

b. If contamination remains in the eyes after flushing or is determined to be in an individual's nose or ears, decontamination will be performed under the direction of the Health Physics Supervisor or qualified medical personnel.

c. Cleansing methods for skin decontamination, in order of harshness are as follows:
   1. Lifting off with sticky tape
   2. Flushing with water
   3. Soap and cool water
   4. Mild abrasive soap, soft brush, and water
   5. Detergent (soap powder)
   6. Mixture 50% powdered detergent and 50% cornmeal

5.1.4 If the contamination cannot be easily removed or the contamination is wide spread, the HPT shall escort the individual to the decontamination facility and notify the Health Physics Supervisor and the Site Manager.

5.1.5 The contamination shall be removed by having the individual wash with soap and cool water several times, if necessary. The methods listed above may be used by the HPT.

5.1.6 If the decontamination is successful, document the results on Attachment 1.

5.1.7 If, after several attempts, the contamination is not successfully removed, notify the Health Physics Supervisor.

5.2 Tool Decontamination

5.2.1 All tools being removed from the Exclusion Zone shall be checked by the HPT.

5.2.2 Tools that are contaminated shall be decontaminated before they can be released from the Exclusion Zone.

5.2.3 Tools shall be decontaminated by the users under the direction of the HPT.

5.2.4 Tools can be decontaminated using scrub brushes and soap and water, wiping with damp rags or wipes, soaking in a decontamination solution, using abrasive materials ultrasonic cleaners, or any other method approved by the HPT.

5.2.5 All interior surfaces of the tools must be decontaminated as well prior to the tool being unconditionally released.

5.2.6 If the tool is decontaminated and released by the HPT, the survey results shall be documented on a Radiological Survey Data Sheet (SOP-345 - Attachment 1)

5.2.7 If the tool cannot be decontaminated after several tries, then the tool shall be painted or sprayed with yellow paint to indicate that the item is radioactive material and kept in the Exclusion Zone.

5.3 Equipment Decontamination

5.3.1 Heavy equipment, such as backhoes, bulldozers, trucks, cranes, shall be washed with high pressure water spray prior to being surveyed by the HPT.

5.3.2 The washing of heavy equipment shall be performed in an area designated by health physics.

5.3.3 Once the equipment is washed, it will be surveyed by the HPT. The HPT will identify any areas on the equipment that need further decontamination and will make recommendations on how to further decontaminate.

5.3.4 All surfaces of the equipment must be decontaminated and surveyed. This includes air intakes, air filters and any internal surface that is likely to be contaminated.

5.3.5 Once the equipment has been surveyed and released by the HPT, the survey results shall be documented on a Radiological Survey Data Sheet (SOP-345 - Attachment 1).

6.0 RECORDS/REPORTS/NOTIFICATIONS

6.1 Release surveys and personnel decontaminations shall be documented on the appropriate form.

6.2 Personal contaminations shall be reported to the Health Physics Supervisor and the Site Manager.

7.0 ATTACHMENTS

7.1 Attachment 1 Contaminated Personnel or Personal Effects Report

ATTACHMENT 1

CONTAMINATED PERSONNEL OR PERSONAL EFFECTS REPORT

DATE OF INCIDENT			TIME OF INCIDENT		
NAME			BADGE NO.		
LOCATION OF INCIDENT (SPECIFIC AREA)					
DESCRIPTION	DESCRIBE IN DETAIL ANATOMICAL LOCATION, CONTAMINANT, TYPE OF INJURY, OR CONTAMINATED ARTICLE				
CONTAMINATED ARTICLE OR AREA	DECONTAMINATION AGENT USED	INSTRUMENT	SURVEY RESULTS		FINAL DISPOSITION OF ARTICLES
			BEFORE	AFTER	
WOUND COUNT /5 MIN		BKGD COUNT /5 MIN		SOURCE COUNT /5 MIN	
SAFETY MEASURES	PERTINENT SAFETY MEASURES IN EFFECT ☐ YES ☐ NO		IF NO, EXPLAIN		
REMARKS					
EMPLOYEE SIGNATURE			HEALTH PHYSICS SIGNATURE		

DUSABLE PARK

STANDARD OPERATING PROCEDURE

Title: Sample Preparation Procedure for Gamma Spectral Analysis

Document: SOP-364

Revision Number: 0

Date: October 5, 2007 Replaces: None

SAMPLE PREPARATION PROCEDURE FOR NUTRANL ANALYSIS

1.0 SCOPE

1.1 Purpose

The purpose of this procedure is to provide guidance for the preparation of samples for analysis of radioactive nuclides. This procedure applies specifically to samples prepared for NUTRANL analysis.

1.2 Applicability

This procedure applies to *all* soil-type environmental samples, including soil, rocks, concrete, and construction debris.

2.0 REFERENCES

2.1 10 CFR Part 20 Standards for Protection Against Radiation

3.0 DEFINITIONS

None

4.0 REQUIREMENTS

4.1 Prerequisites

NONE

4.2 Tools, Materials, Equipment

4.2.1 The following equipment is needed to perform this procedure:

- 20 ml sample vials
- Sieve of one-quarter inch mesh
- Analytical balance
- Marinelli beakers
- Zip-lock bags
- Labels
- Paper towels

4.3 Precautions, Limits

4.3.1 Samples prepared for receipt at field laboratory for NUTRANL analysis are homogenized during sample collection prior to receipt at the field laboratory for analysis. No other physical preparation is performed at the laboratory for screening samples (NUTRANL analysis). Any corrections or analysis other than NUTRANL pulse height analysis shall be performed by an outside contract laboratory. This includes U. S. Environmental Protection Agency (USEPA) verification samples and quality control (QC) samples.

4.3.2 All samples not known to be homogenous must be homogenized prior to analysis.

4.3.3 NUTRANL analysis is designed and calibrated for analysis of low activity samples, specifically for documenting closure at less than the specified cleanup criteria. High activity samples may produce anomalous results due to algorithms in the NUTRANL programming.

4.4 Acceptance Criteria

Proper preparation during sample collection ensures that the samples submitted to the laboratory are representative of the material sampled and suitable for the required analysis. Acceptable samples will be homogeneous with regard to size of material; appearance with regard to color, moisture and soil type; shall not contain materials over the specified maximum gradation; and shall be free of external adhering soil or other materials.

5.0 PROCEDURE

5.1 All Samples

5.1.1 All samples submitted for analysis must be logged in the chain of custody book. The following information shall be recorded and shall be taken directly from the field chain of custody form or a copy of the chain of custody form must be filed in the chain of custody book.

- Description or grid location
- Purpose of sample which may include:
  - Activity screening
  - Pre-verification
  - Verification
  - Overburden
  - Imported fill
  - Calibration quality control check
- Date and time of sampling
- Originator of sample
- Corresponding count rate from survey meter (optional)

5.1.2 Ensure that outside of sample container is free from potential contamination, by wiping it clean with a paper towel.

5.1.3 Place blank label on outside of container and record the sample ID, which is a unique sequential number used to identify individual samples. The unique sequential number, sample ID, is obtained from project sample log books.

5.1.4 Weigh the sample on the analytical balance. Subtract the empty (tare) weight which is recorded on the side of each vial and record the net weight in grams on the label.

5.1.5 Prepare the sample in accordance with the requirements of the analysis requested.

5.1.6 Samples will have already been homogenized and passed through a ¼ inch mesh during sampling. It should not be necessary for any samples to be re-opened in the field laboratory. This will eliminate the potential for the field laboratory area to become cross-contaminated. This will also allow for ingrowth. Note will be made on the sample label each time the vial is opened.

5.1.7 Verification samples received for the USEPA are also logged in the chain of custody book. Verification samples are prepared in the same manner as others; however, they come in batches of five 20 ml vials. When samples are to be picked up by the USEPA, place each batch of five sub-samples in its own zip-lock bag.

5.2 Quality Control Samples

5.2.1 QC Samples shall be placed into 500 ml Marinelli beakers prior to analysis.

5.2.2 The technician obtaining the sample shall obtain a split sample into a 20 ml sample vial from the Marinelli beaker. This split is performed in the exclusion zone prior to submitting the sample for analysis. The split sample shall be labeled with the same description as the QC sample. The split sample shall be homogeneous with regard to the remainder of the QC sample.

5.2.3 The net weight of the Marinelli beaker shall be noted on the sample label attached to the beaker. The net weight is obtained by subtracting the weight of the beaker (tare) from the total weight of the filled beaker. The tare (empty) weight of the Marinelli beaker is recorded on the outside of each beaker.

5.2.4 The outside laboratory performing analysis of the QC sample shall be responsible for all additional sample preparation, and requested analysis. This includes moisture correction and/or daughter nuclide ingrowth analysis.

5.2.5 Analyze the split sample (20-ml vial) using the NUTRANL System and retain records for future comparison to gamma spectroscopy results.

6.0 RECORDS/REPORTS/NOTIFICATIONS

6.1 Notify the laboratory technician when the samples are properly labeled and ready for analysis.

6.2 Samples shall be retained until all evaluations have been completed and the sample is no longer needed. Samples will not be discarded until written notice is received from USEPA. Samples may be transferred to a secure holding area off-site.

6.3 Retain a paper copy of all sample analysis reports

7.0 ATTACHMENTS

None

APPENDIX C

Instrument Calibration

STS

Ludlum Model 2221/44-10 Calibration

Model 2221 serial number: 172039

Probe 44-10 serial number: 174496

Date: 10/23/07

Scaler Linear Check

Pulser model/serial number: Ludlum 500 1 142038

Calibration Due Date: 7/25/08

Threshold set to 100 mv. GAH (tech. init.)

Pulser setting in cts.	Multiplyer	As Found Scaler reading in cts.	After Adjustment Scaler reading in cts.
400	X1	400	-
4k	X10	4001	-
40k	X100	40007	-
400k	X1000	400058	-

Voltage Plateau

Source isotope/serial number: Cs-137 0.894 uCi on 12/00/84 4830

BKGD PLATEAU volts	BKGD PLATEAU counts (Source / Bkg counts)		SOURCE PLATEAU volts	SOURCE PLATEAU counts (Source / Bkg counts)	
700	32901	2080	1100	41337	5280
750	36876	3047	1150	43508	5204
800	38296	3685	1200	48813	5043
850	39834	4192			
900	39874	4300			
950	42235	4507			
1000	41918	4873			
1050	41852	4837			

operating voltage selected: 950 v

575

Ludlum Model 2221/44-10 Calibration

Model 2221 serial number: 172039

Probe 44-10 serial number: 174496

Date: 10/23/07 ☒ window verified at about 3830

unshielded - normal cord

Instrument BKGD

1 minute BKDG counts

4791	4866
4839	4882
4981	4929

Average: 4881.3

Source Block Data

Source block ID: 2012 - 5473A / 2012 - 5473A / 2012 - 5473A / 2012 - 5473A

1 minute Source Block counts

24914	25271
25312	25079
25050	25146

Average: 25128.7 cpm Net Average: 20247.4 cpm

Activity Calculation

Net Average source count rate of: 20247.4 cpm divided by 10 = 2024.74

Times ~~7.2~~ 7.1 = 14375.65 (A)

Square root of (A) = 119.90 times 2 = 239.8 (B)

(A) plus the average BKGD = 19256.95 CPM/~~7.2~~ 7.1 pCi

The cutoff value is: 19,017 (CPM/~~7.2~~ 7.1 pCi minus (B))

Calibration performed by: [signature] DATE: 10/23/07

Calibration approved by: _____ DATE: _____

STS

Ludlum Model 2221/44-10 Calibration

Model 2221 serial number: 122039

Probe 44-10 serial number: 174496

Date: 10/23/02 ☒ window verified at about 3830 w/ 6" shield

Instrument BKGD

1 minute BKDG counts

1205	1234
1292	1259
1241	1305

Average: 1256

Source Block Data

Source block ID: 2012-541TA, 2012-542TA, 2012-543TA, 2012-544TA

1 minute Source Block counts

9662	9800
9606	9746
9841	9761

Average: 9736 cpm Net Average: 8480 cpm

Activity Calculation

Net Average source count rate of: 8480 cpm divided by 10 = 848

Times ~~7.2~~ 7.1 = 6020.8 (A)

Square root of (A) = 77.59 times 2 = 155.18 (B)

(A) plus the average BKGD = 7276.8 CPM/~~7.2~~ 7.1 pCi

The cutoff value is: 7122 (CPM/~~7.2~~ 7.1 pCi minus (B))

Calibration performed by: [signature] DATE: 10/23/02

Calibration approved by: _____ DATE: _____

STS

Ludlum Model 2221/44-10 Calibration

Model 2221 serial number: 172039

Probe 44-10 serial number: 174496

Date: 10/23/07 ☒ window verified at about 3830

unshielded w/ .25" rod

Instrument BKGD

1 minute BKDG counts

3171	3156
3194	3126
3192	3170

Average: 3168.2

Source Block Data

Source block ID: 2012-5417A, 2012-5427A, 2012-5437A, 2012-5447A

1 minute Source Block counts

16974	16912
16942	16891
16955	16956

Average: 16938.3 cpm Net Average: 13770.1 cpm

Activity Calculation

Net Average source count rate of: 13770.1 cpm divided by 10 = 1377.01

Times ~~7.2~~ 7.1 = 9776.77 (A)

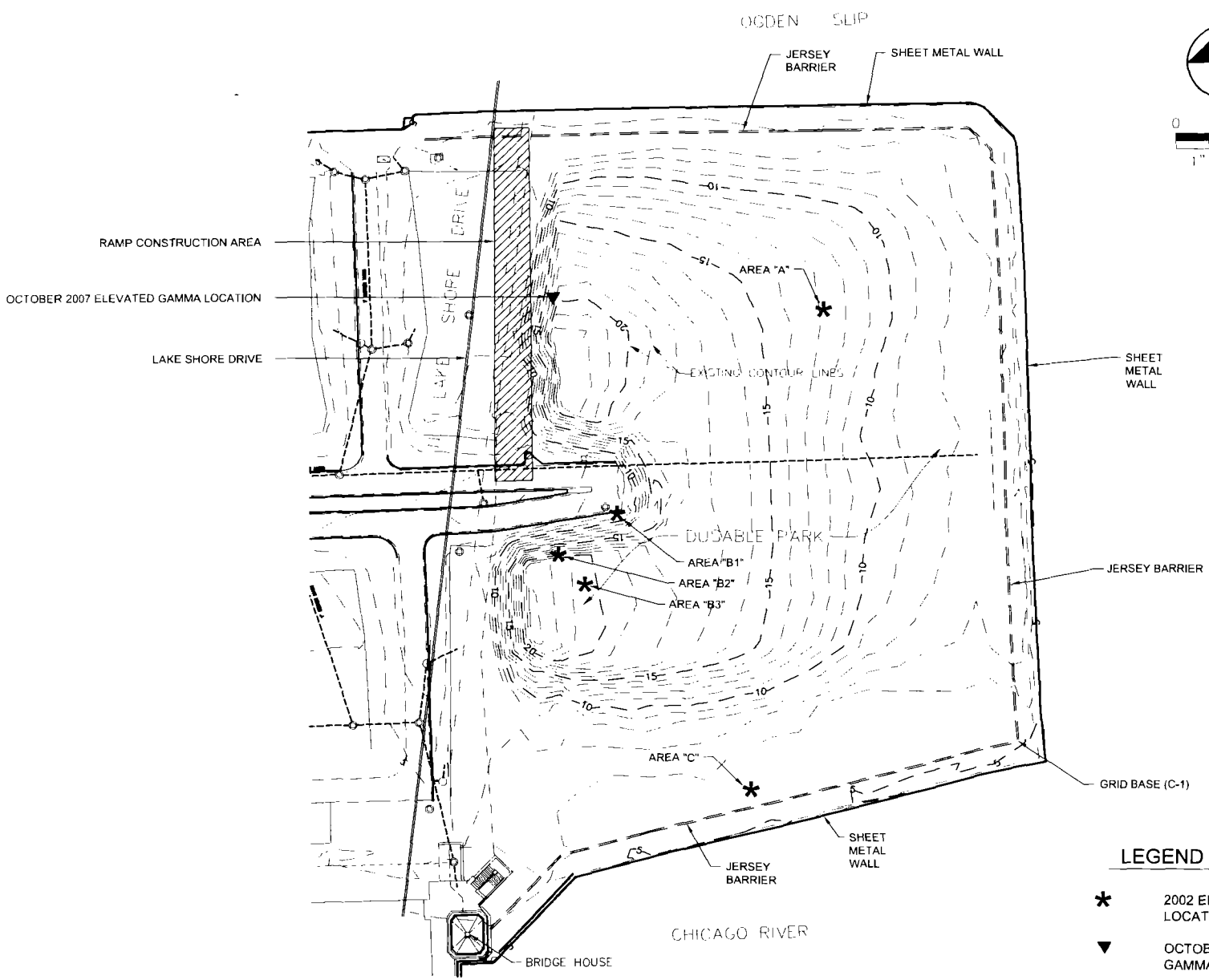
Square root of (A) = 98.88 times 2 = 197.76 (B)

(A) plus the average BKGD = 12944.77 CPM ~~7.2~~ 7.1 pCi

The cutoff value is: 12747 (CPM ~~7.2~~ 7.1 pCi minus (B))

Calibration performed by: [signature] DATE: 10/23/07

Calibration approved by: _____ DATE: _____



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ELEVATED GAMMA SURVEY
RAMP CONSTRUCTION AREA
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Drawn:	EMP 12/20/2007
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Approved:	DMAC 12/20/2007
PROJECT NUMBER	200702842
FIGURE NUMBER	1.0

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